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ROLL-HANSEN (F.). **Undersøkelser over Polyporus annosus Fr., særlig med henblikk på dens forekomst i det sønnefjelske Norge.** [Studies in *Polyporus annosus* Fr., especially in respect of its occurrence in Norway south of the Dovre Fell.]—*Medd. norske Skogsforsøksv.* 24 (vii, 1), 100 pp., 33 figs., 1940. [Received October, 1945.]

Until 1937 *Polyporus* [*Fomes*] *annosus* was known in south-eastern Norway principally as a destructive parasite of spruce (*Picea abies*), responsible for heavy financial losses in standing plantations, whereas its incidence on Scots pine (*Pinus sylvestris*) was of negligible importance. In the west of the country the situation was reversed [*R.A.M.*, xviii, p. 772, xxv, p. 18]. This peculiarity of distribution suggested the existence of two distinct races of the fungus, and field and laboratory investigations were carried out to explore this possibility.

F. annosus was shown, contrary to the general impression, to be not uncommon on pines in the south-east and very prevalent on spruce in the west, and also to spread, not only between its two coniferous hosts, but also between the latter and non-conifers, such as birch, *Empetrum* sp., *Calluna vulgaris*, and *Vaccinium myrtillus*. Fruit bodies of the fungus were further detected on *Abies alba*, *A. balsamea*, *A. nobilis*, *Juniperus communis*, larch (*Larix decidua* and *L. sibirica*), *Picea glauca*, *P. jezoensis*, *P. pungens*, *P. sitchensis*, *P. cembra*, *P. contorta* var. *latifolia*, *P. mugo* var. *rotundata*, Douglas fir (*Pseudotsuga taxifolia*), *Tsuga heterophylla*, alder (*Alnus glutinosa* and *A. incana*), *Crataegus* sp., *Sorbus aucuparia*, and *S. intermedia*.

No significant differences were calculated in the measurements of basidiospores from sporophores collected in various parts of the country or on diverse hosts, though the indication of a smaller length-to-breadth ratio in the south-eastern as compared with the western specimens might be worth following up with more material. Malt agar cultures of 31 isolates from different hosts in the south-east and west also grew at approximately the same rate, nor were any lines or zones formed between the various strains growing in proximity to one another. A pure culture of *F. annosus* from a sporophore on pine infected not only its own host but also birch and spruce plants under aseptic conditions in Erlenmeyer flasks. There was no perceptible variation in appearance or odour between cultures of the fungus from different localities or diverse hosts.

The relatively few reports of *F. annosus* on spruce in the west may be attributed in part to its actually lower incidence and for the rest to the fact that the plantings are too young to have sustained appreciable damage from this source. Its prevalence on Scots pine in the west may be due to a climate unfavourable to the host.

Referring to the above-mentioned hosts of the fungus, the author attaches particular importance to *E.* sp., *V. myrtillus*, and *Calluna vulgaris*, of which the two first-named were probably not previously known to harbour *F. annosus*, while all three, particularly *V. myrtillus* and *C. vulgaris*, are so widespread in Norwegian forests as to assist materially in the transmission of the parasite.

Cytological studies showed that mycelial cells generally contained a large number (10 to 20) of nuclei, the occurrence of only one or two being exceptional. The

maximum number of nuclei, often exceeding 100, developed in the conidiophores before proceeding into the conidia, where they seldom rose above four or sank below one; the basidiospores were usually uni-, occasionally binuclear, while the young basidia mostly contained one, two, or four, rarely five or (?) three. The conidia are smooth and the basidiospores echinulate, the former are less skew than the latter, and the ratio of length to breadth is greater in the former. Clamp-connexions were observed on the hyphae of the fungus both in pure culture and in spruce wood, this being apparently the first record of their occurrence in *F. annosus*.

The mean growth rates of the above-mentioned 31 isolates at 12°, 21·5°, 24·2°, 25·9°, 27·5°, 29·4°, 30°, and 30·7°, reckoned in 0·01 mm. per diem, were 349, 640, 751, 705, 610, 283, 107, and 35, respectively. In a further 46, the growth rate at 12° ranged from 191 for an isolate from spruce to 436 for one from *Abies* sp. Exposure of malt agar cultures to 42° for two hours killed the fungus.

In none of the inoculation experiments with several isolates of the fungus on various plants in sterilized and unsterilized soil was more than a low percentage of infection obtained, denoting the relative weakness of *F. annosus* as a parasite.

In several cultures an abrupt slowing-down of the growth rate was accompanied by abnormalities of appearance, which may be ascribed, at any rate in part, to the production of 'degenerate' mycelia from a single conidium. A high percentage of monoconidial mycelia were found to grow at a considerably slower rate than that of the parent mycelium, and a similar phenomenon was observed in the case of single-basidiospore mycelia.

URQUIJO (P.). **Mycosphaerella patouillardi Sacc., y otros hongos folícolas del Boj.** [*Mycosphaerella patouillardi* Sacc. and other foliicolous fungi of Box.]—*Bol. Pat. veg. Ent. agríc., Madr.*, xiii, pp. 135–140, 4 figs., 1944.

A severe attack on box (*Buxus sempervirens*) by *Mycosphaerella patouillardi* Sacc. was observed in the Sada district of Corunna, the infected foliage bearing white marginal spots dotted with the black perithecia of the fungus. The shape of the asci is described by Traverso in 'Flora italica cryptogama' (Part I, fasc. 2, p. 610, 1913) as cylindrico-claviform, but in the writer's isolates they were more digitiform, with an elongated basal third; in some cases the ascospores were all aggregated in one section of the ascus instead of being evenly distributed throughout its length. The fungus is also recorded (as *Sphaerella patouillardi*) by Da Sousa da Camara *et al.* from Portugal [*R.A.M.*, xvi, p. 563].

Puccinia buxi [ibid., ix, p. 601] appears to be rare in Spain, no mention of the rust being made by González Fragoso in his 'Flora ibérica: Uredales' [ibid., iii, p. 687]. *Chaetodochium buxi* [ibid., xxiii, p. 503] was collected on *B. sempervirens* by González Fragoso at Seville and Madrid. Other Iberian Ascomycetes listed by Unamuno (*Mem. R. Acad. Madr.*, 1941) on box are *Microthyrium microscopicum*, *Hyponectria buxi* [*R.A.M.*, xvi, p. 563; xxiii, p. 503], *Nectria desmazierii* (also recorded by Da Sousa da Camara *et al.* [ibid., xviii, p. 711], *Guignardia buxicola*, [loc. cit.] and *Leptosphaeria buxina*, all from Portugal, and *G. buxi*, *Didymosphaeria buxina*, *Metasphaeria papulosa* f. *limbalis*, and *Phyllosticta* (*Ascochyta*) *buxina* [ibid., xiii, p. 596].

FINDLAY (W. P. K.). **Dry rot and its prevention.**—*J. R. sanit. Inst.*, lxv, 2, pp. 85–90, 1 diag., 1945.

In connexion with the increasing prevalence of dry rot (*Merulius lacrymans* and *Coniophora cerebella* [*C. puteana*]) during recent years [*R.A.M.*, xxiv, p. 393], the author discusses the problem (a major one in some districts where general neglect and war damage have combined to admit moisture into buildings) under the headings of cause and nature, conditions influencing development, cure, prevention, and increase of dry rot as a result of the war. The paper, read at a special Sessional

Meeting of the Royal Sanitary Institute on 17th January, 1945, was followed by a discussion.

EADES (H. W.). **Cause and prevention of decay in wooden buildings, with particular reference to coastal B.C.**—*B.C. Lumberm.*, xxix, 12, pp. 28–29, 92, 94, 96–98, 2 figs., 1945.

Annual losses from decay in timber used for building in British Columbia assume high proportions, but they are largely preventable by the observance of a few simple precautions on the part of builders, householders, and architects, which the author summarizes under the headings of selection of material, use of wood preservatives, drainage, dry lumber, ventilation, decay infection from the ground, decay in posts and poles, protection from intermittent moisture, and sawdust bins. [This paper is also published as *Circ. Dominion For. Serv.* 61.]

TAMBLYN (N.). **Service tests of fluarized Karri rail sleepers in Western Australia.**—*J. Coun. sci. industr. Res. Aust.*, xviii, 3, pp. 254–262, 1945.

Details are given of a co-operative test made by the Division of Forest Products, the Western Australian Government Railways, and the Western Australian Forests Department, in which some 3,000 karri (*Eucalyptus diversicolor*) railway sleepers were installed in 22 test sections of the Western Australian Government Railway after treatment by the fluarizing process, developed and patented by the Western Australian Forests Department during the period 1924–26. The treatment consisted in boiling the green sleepers in a solution of 3·7 per cent. sodium fluoride (95 to 97 per cent. purity), 0·2 per cent. sodium dinitrophenate (100 per cent.), 1 per cent. arsenious oxide (95 per cent.), 0·2 per cent. soda ash (94·9 per cent.), and water. Boiling lasted for 10 hours, and was followed by 36 hours' cooling before removal from the solution.

From the data obtained, the average service life of all fluarized karri sleepers in the test is estimated at 13 years, the figures ranging from 10·1 to 17·8 in the 22 test sections. Untreated karri sleepers, installed in one test section only, gave an average service life of 6·3 years, while the estimated life of untreated jarrah [*E. marginata*] controls in the same section was over 20 years.

The fluarized sleepers failed mainly owing to decay, associated occasionally with termite attack. In some sections where the decay hazard was low, mechanical failure also became important. The weakness of the treatment appears to lie in shallow penetration of the material and liability of the treated sleepers to end-splitting.

KROGH (P. M. D.) & TOOKE (F. G. C.). **Pentachlorophenol solutions for the preservation of wood.**—*Fmg S. Afr.*, xx, 237, pp. 761–769, 1945.

The authors give an account of studies at the Forest Products Institute and Forest Insect Laboratory, Pretoria, on the effectiveness of pentachlorophenol as a timber preservative [*R.A.M.*, xxiv, p. 393]. This material possesses high toxicity, ensuring protection with absorption of low concentrations and consequently small cost, low solubility in water, and low vapour pressure. Its solubility ranges from 4 p.p. million at 0° C. to 35 at 50°. This exceptionally low solubility minimizes loss by leaching, and affords greater permanence than is obtained from more soluble materials. In vapour pressure it ranges from 0·00001 mm. mercury at 0° to 0·0023 mm. at 50°.

Experimental evidence demonstrated that certain coal-tar naphthas dissolved up to 10 per cent. of pentachlorophenol and all possessed high penetrating power. They were all highly inflammable, however, and linseed and other oils prove more satisfactory. Adequate penetration of hemlock [*Tsuga* sp.], Baltic deal [*Pinus* sp.], and South African *P. palustris, P. caribaea, P. taeda, P. patula, P. insignis,*

and *P. pinaster* was given by a one-minute cold dip in pentachlorophenol 3·85 per cent. by weight, linseed oil at 21·15 per cent., and mineral turpentine 75 per cent., or pentachlorophenol 4 per cent., seal oil 20 per cent., and mineral turpentine 76 per cent., or pentachlorophenol 4 per cent., sostroil 16 per cent., and mineral turpentine 80 per cent. All these solutions dry quickly and produce no 'blooming' on the surface of the wood.

The paper concludes with notes on the treatment of woods refractory to dipping processes, cost of treatments with pentachlorophenol, fire hazard, the effects of the treatments on glueing, and the toxicity of the substances to workers.

LEBEAU (F. J.). **Systemic invasion of Cabbage seedlings by the downy mildew fungus.**—*J. agric. Res.*, lxxi, 10, pp. 453–463, 3 figs., 1945.

Systemic development of the mildew mycelium of *Peronospora parasitica* in mature cabbage heads in storage [*R.A.M.*, xv, p. 188], in the field [ibid., v, p. 643], and in turnip roots has been reported, but the author believes that this is the first time that the systemic development of *P. parasitica* in the tissues of the hypocotyl and cotyledons of cabbage seedlings has been recorded.

In southern Mississippi, where cabbage seed for plant production for the early spring crop is sown from 15th October to 10th November, severe epidemics of mildew frequently cause a loss of 50 per cent. or more of young plants, the extent of the damage varying with the age of the plants when attacked and with weather conditions. It appears that soil-borne oospores are probably the initial cause of outbreaks. The greatest damage results when plants are infected before the first true leaf is fully developed and when the appearance of the disease is followed by moist, cool days as the prelude to a long period of dry weather. The moist period favours abundant sporulation and rapid spread of infection, while sunny weather thereafter brings about rapid desiccation and necrosis of the infected hypocotyls. The survival of the plants is much greater when sporulation and rapid spread of infection are followed by a long period of cool, cloudy weather, the fungus being retarded by the low temperature, while the seedlings gradually outgrow the disease. If the seedlings have reached the three- to four-leaf stage when infection occurs, the greatest damage results where a long spell of cool, moist weather follows, though the effect is one of arrested growth rather than lethal. Recovery is rapid in dry periods. Plants exposed to continuous low humidity were found by Felton and Walker (in a paper awaiting publication) to outgrow the disease most rapidly, especially at high temperatures, and this accords with observations made under field conditions in Mississippi. The tissues of seedlings attacked by mildew were shown to be infected from a single point of inoculation and thus, once a general infection had been established in a seed-bed, the continued production of inoculum diminished in importance. Systemic infection does not spread from the hypocotyl to the stem. With older seedlings, in which individual points of infection affect only a localized area of the leaf tissues, the ultimate severity of the disease is determined by the number of infections, and in this case it follows that conditions favourable for sporulation and infection must be maintained in order to ensure a continuous severe disease epidemic. Sporulation from mildew lesions has been shown to cease abruptly when exposed to low humidity. Whether a connexion can be shown between the systemic invasion of cabbage seeds and that of cabbage heads by *P. parasitica*, or whether the systemic mycelium in the hypocotyl is sloughed off with the cortex as secondary growth proceeds, remains to be determined.

WHITEHEAD (S. B.). **Control of club root.**—*Gdnrs' Chron.*, Ser. 3, cxix, 3080, pp. 9–10, 1946.

Two important factors predispose cruciferous crops to club root (*Plasmodiophora brassicae*) [*R.A.M.*, xxiv, pp. 260, 475], soil acidity and lack of soil aeration. In

acid soils, more spores are released and the plants are more susceptible than in alkaline soils. The fungus may be present in soils of P_H 5 to 7·8, but germination and infection do not occur at P_H 7·1 to 7·4. As *P. brassicae* appears to require moisture for its germination, low-lying, badly drained soils harbour the disease, but infection may occur in well-drained soil saturated by heavy rain. The author considers the inhibiting factor to be soil aeration rather than absence of moisture. If a soil is well supplied with humus-forming organic matter, promoting aeration, readily absorbing rain, and reducing the free movement of excess water to a minimum, infection is less likely.

Control measures recommended include the prompt destruction by burning of all diseased plants (boiling diseased roots if they are to be fed to stock), rotation, immediate elimination of cruciferous weeds, liming to bring the soil to P_H 7·2 at least, the avoidance of all acid-reacting fertilizers, improvement of soil aeration by attending to the drainage and applying liberal dressings of well-rotted organic material, and the use of mercurous chloride (dusting each hole at transplanting with a teaspoonful of 4 per cent. calomel dust) if crucifers have to be grown in suspected soil or when infected soil cannot be rested longer than one or two seasons.

Wallace (T.), Hewitt (E. J.), & Nicholas (D. J. D.). **Determination of factors injurious to plants in acid soils.**—*Nature, Lond.*, clvi, 3974, pp. 778–779, 2 figs., 1945.

After pointing out that injury to crops on acid soils is probably due in part to excess of soluble manganese, the authors briefly describe the results of studies at Long Ashton, Bristol, on the effects of soil acidity on runner bean (*Phaseolus multiflorus*) and cauliflower. The data obtained showed that the characteristic field acidity leaf symptoms of these crops, i.e., interveinal chlorosis and necrotic spotting of runner bean and incurled margins of cauliflower, result from manganese toxicity, though the effects are modified by the calcium status, being severe with low calcium and substantially decreased by high calcium. It was shown that readily extractable manganese in plant tissues is reduced by high calcium status.

Other work showed that on runner bean the symptoms of calcium deficiency are slightly pale green leaves with necrotic spots, particularly near the tips and round the margins, and progressing inwards interveinally, while on cauliflower the young leaves are distorted, with tips brown and sharply hooked backwards or forwards, and on the older leaves the marginal and interveinal areas become wilted and finally brown. These results clearly demonstrate the importance of manganese toxicity in acid soils.

The Scottish Plant-Breeding Station, Craigs House, Corstorphine, Edinburgh.—*Trans. Highl. agric. Soc.*, Ser. 5, lvii, pp. 75–77, 1945.

Finger-and-toe [club root: *Plasmodiophora brassicae*], the most important swede disease, is to some extent remediable by breeding. The method formerly adopted at the Scottish Plant Breeding Station, of setting aside a small area of highly infested land for the testing of strains and selection of apparently resistant plants, has not proved altogether satisfactory owing to the immense variation in the severity of the parasite from season to season, involving the death of all the plants in one year and their virtual immunity in another. Another disadvantage of trials conducted on these lines is connected with the erratic distribution of the fungus in the soil, which means that an apparently sound plant may merely have occupied a site where the organism was inactive. Considerable use is now being made of a mycological seedling test, based on the argument that a plant capable of withstanding the disease in the early stages of growth will not suffer appreciably from later

attacks, even if nodules are produced. Seed is sown or seedlings pricked out, in sterilized soil in shallow wooden boxes, to which the inoculum is evenly applied by watering with a nodule extract. Some weeks later the young plants are examined and those free from excrescences transplanted to pots for breeding.

HUGHES (S. J.). **A leaf spot of Mangolds caused by Pleospora herbarum (Pers.) Rabenh.**—*Trans. Brit. mycol. Soc.*, xxviii, 3–4, pp. 91–93, 1 pl., 1945.

A spotting of mangold, characterized by circular spots, coalescing on badly infected leaves and causing extensive discoloration, with older spots showing concentric rings of light and dark brown areas with well-defined outer margins, was observed at Llanvaches, Monmouthshire, in October, 1943. Even in the field the fungus produced abundant conidia, giving the spots a sooty appearance. Only *Stemphylium botryosum* [*R.A.M.*, xxv, p. 166] was seen on the spots.

The crops showed evidence of potash deficiency, with premature withering of the older leaves, which drooped round the crown like a rosette. The yield, estimated at 40 tons per acre, appeared normal as the roots had swollen well, although some had hollow centres. Soil analysis confirmed the potash deficiency. Following excessive nitrogen manuring, including dung, with only one potash application, most plants showed leaf-spotting due to *Pleospora herbarum*; those exhibiting potash deficiency were most severely attacked, lesions being numerous and large both on green and partly withered leaves, although the inner and younger unfolding leaves were usually unaffected, suggesting that the spot is largely associated with a weakening of the older leaves and with potash deficiency combined with high nitrogen status. *P. herbarum* was obtained in culture on dung-agar and straw in good light at 10° to 12° C., ascospore measurements being 34·2 to 41·4 by 14·4 to 18 μ and conidia 29·7 to 42·3 by 14·4 to 23·4 μ.

Experimental inoculations with conidia and mycelium on apparently healthy plants showed no infection where the leaf was undamaged, whereas leaves injured with a needle produced typical ring-spot lesions readily. *P. herbarum* was isolated from the diseased tissues. Inoculations on previously damaged petioles were also successful, but not those on roots.

FIFE (J. M.) & CARSNER (E.). **Tip burn of Sugar Beet with special reference to some light and nitrogen relations.**—*Phytopathology*, xxxv, 11, pp. 910–920, 3 figs., 1945.

Sugar beet leaf tipburn, described by Robbins from Colorado as one of the features of mosaic [*R.A.M.*, i, p. 230], has since been observed in California, Washington, Idaho, Utah, and Arizona on field crops, and on greenhouse mother beets in Wyoming and Minnesota as well. The condition, which is of negligible economic importance, is believed to be due to toxic concentrations of substances normally present and develops in plants after protracted cultivation in fertile soil containing an abundance of nitrogen. The toxic substances involved in the disturbance are probably nitrogenous constituents and are accumulated in the root. Complete recovery ensues if the affected plants are transferred to a high light intensity and other conditions favourable to their growth.

BJÖRLING (K.). **Pleospora betae n. sp., die Schlauchfruchtform von Phoma betae (Oud.) Fr.** [*Pleospora betae* n. sp., the ascogenous state of *Phoma betae* (Oud.) Fr.]—*Bot. Notiser, 1944*, 2, pp. 215–222, 4 figs., 1944.

This paper contains the Latin diagnosis of *Pleospora betae*, a fuller account of which, demonstrating its genetic connexion with *Phoma betae* and describing its effects on sugar and fodder beets, has already been noticed from another source [*R.A.M.*, xxv, p. 55].

Reid (W.D.) & Taylor (G.G.). **Control of halo-blight and anthracnose of Beans.**—*N.Z.J. Sci. Tech.*, A, xxvii, 2, pp. 90–93, 1945.

In 1943–4 and 1944–5, dwarf beans [*Phaseolus vulgaris*] infected with halo blight (*Pseudomonas medicaginis*) and anthracnose (*Colletotrichum lindemuthianum*) [*R.A.M.*, xxiii, p. 284] were sprayed twice to four times with Bordeaux mixture or cuprox (copper oxychloride), the Surecrop Stringless Wax variety being used in the former and Masterpiece (or Matchless) in the latter year. Four treatments reduced halo blight to negligible proportions, the incidence on 21st March, 1945, in plots sprayed with 6-8-100 Bordeaux or 5-100 cuprox being 3·2 per cent. as against 81·2 in the controls; the corresponding figures for two applications of Bordeaux (3-8-100) or cuprox in the same season were 20·1 and 17·1 per cent., respectively, and for three in 1943–4 (25th February) 7·75 and 3·75 per cent., respectively (controls 11·5 per cent.). The four Bordeaux and four cuprox treatments increased the seed yield in 1944–5 (20th April) over an area roughly two chains square from 98·8 to 145·1 and 146·2 oz., respectively. Cuprox at 2½–100 was less effective. In 1944–5 (21st March) the incidence of anthracnose was reduced by four applications of Bordeaux 6–8–100 and four of cuprox 5–100 from 35·8 to 20·7 and 16·4 per cent., respectively.

Nicolaisen (N.) & Scupin (L.). **Die Kopffäule der Speisezwiebel. Ein Beitrag zur Feststellung der Ursachen, die zur Kopffäule der Speisezwiebel führen.** [The head rot of table Onions. A contribution to the determination of the causes leading to head rot of table Onions.]—*Z. Lebensmitt. Untersuch.*, lxxxvi, 3–4, pp. 208–217, 9 figs., 1943. [Received November, 1945.]

Full particulars are given of experimental studies carried out in 1941 at Magdeburg, Germany, on the causes underlying the troublesome and destructive development of 'head' ('neck') rot of onions (*Botrytis allii*) [*R.A.M.*, xxv, p. 90] in cold storage. Onions were harvested at three stages of maturity, viz., on 27th August, when the 'necks' were soft and fresh and the bulbs green, on 3rd September, when the bulbs were half-withered, not ready for harvesting, and 16th September, when they were dry and fit for harvesting. A quarter of each lot was (*a*) cleaned and stored two or three days after harvesting, (*b*) of the bulbs harvested while green or half-ripe and cleaned while fresh, a part was subjected to artificial heat for six to eight hours at 35° C., (*c*) allowed to dry naturally in the field, then cleaned and stored, and (*d*) after natural drying and cleaning pre-stored for five days at 20°. The onions were stored at −2·5° to −3°, with a relative humidity of 85 per cent., small batches also being kept at 1°.

The following percentages of infection developed in the four lots from the three harvests: 27th August, (*a*) 77·8, (*b*) 55·8, (*c*) 19·6, and (*d*) 20·9; 3rd September, 88·5, 78·4, 21·5, and 19·2, respectively; and 16th (? 19th) September, 65·7, 45·3 (dried for three days at room temperature), 18·5, and 21, respectively. It is apparent from these data that the natural drying of the onions in the field promoted resistance to storage infection by firmly sealing the junction between the 'neck' and bulb through which the fungi gain ingress, and was a much more important factor in the duration of their keeping properties than was the date of harvesting.

Onions attacked by downy mildew (*Peronospora schleideni*) [*P. destructor*] in the field are particularly liable to storage infection by *B. allii*.

Hopkins (J. C. F.). **The importance of seed disinfection of Ground Nuts.**—*Rhod. agric. J.*, xlii, 5, pp. 432–433, 1945.

The three chief groundnut diseases that require to be guarded against in Rhodesia are seed rot (caused by various soil-inhabiting fungi attacking injured seed [cf. *R.A.M.*, xxii, p. 236], root rot (*Sclerotium rolfsii*) [ibid., xix, p. 579], and rosette

[ibid., xxiii, p. 432]. The first can be overcome, provided the seed is of reasonably good quality, by disinfection with the proprietary mercurial dusts sold locally, applied at the rate of 5 oz. dust per bag (180 lb.) shelled seed. Root rot is not common in Rhodesia, but recurs sometimes during a hot, dry spell, following incessant rain, especially if the crop is planted in heavy or poorly drained soils. Against this disease the measures recommended are seed disinfection as for seed rot, rotation, and planting in well-drained, friable soil. To avoid rosette, a good stand is necessary, in order that the plants may resist drought; seed should therefore be carefully selected and dusted before planting.

IVANOFF (S. S.). **Texas Cantaloupe resists aphids, downy mildew.**—Reprinted from *Sth. Seedsm., 1945,* 2 pp., 3 figs., 1945.

The work described in this paper on cantaloupe resistance in southern Texas to *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* and *Aphis gossypii* has already been noticed from another source [*R.A.M.*, xxiii, p. 373].

ALLINGTON (W. B.). **Wildfire disease of Soybeans.**—*Phytopathology*, xxxv, 11, pp. 857–869, 4 figs., 1945.

The causal organism of tobacco wildfire, *Pseudomonas tabaci* [*P. tabacum*], was found, in the course of an intensive disease survey in 1943, to be prevalent on soybeans in most parts of the United States where the crop is grown on a commercial scale [*R.A.M.*, xxiv, p. 264]. The morphological, physiological, serological, and pathological characters of the isolates from both hosts were identical. Water-soaking of soy-bean leaf tissue, even for a short period, especially by beating rain, greatly facilitates penetration by the pathogen and its spread within the host. Thus, in seven tests with non-water-soaked leaves immersed in a very weak solution of the organism, the average numbers of bacteria per disk (average of 10 leaf disks) after one and 24 hours were 8·8 and 14·7, respectively, the corresponding figures for the water-soaked series being 11,643·1 and 16,543·8, respectively.

Edible and poisonous fungi.—*Bull. Minist. Agric., Lond.*, 23, v + 35 pp., 27 col. pl., 7 diags., 1945. 3*s.* 6*d.*

This attractively written and beautifully illustrated popular handbook, revised by Miss E. M. Wakefield, provides explicit information on 15 edible and 12 poisonous fungi [*R.A.M.*, xxv, p. 173], including means by which they can be recognized, when and where they are likely to be found, and suggestions for their preparation, where suitable, as food.

GARCIA (L. A. A.). **Acrothecium leaf spot of Basella rubra L.**—*J. Agric. P.R.*, xxvii, 4, pp. 149–163, 8 figs., 1945.

Humid atmospheric conditions, accompanied by relatively high temperatures, are held to have favoured the infection of *Basella rubra* by a species of *Acrothecium* [*R.A.M.*, xxiii, p. 347] not previously recorded in Puerto Rico and thought to be a new pathogen of this plant, which is grown for its edible foliage. Infection appeared on the leaves as a few small, yellowish-brown or reddish spots which enlarged slowly in dry weather and sometimes showed yellowish marginal zones or a reddish halo. In wet weather the leaf spots enlarged more rapidly and coalesced to form great patches of necrotic tissue. Lesions frequently developed near the margins and particularly towards the tips. Severely affected plants became chlorotic and heavily diseased leaves abscissed. Both young and mature leaves were susceptible and showed pronounced curling or rolling. Vines showed at first similar spots to those on the leaves but the lesions enlarged into long, lustrous, reddish, superficial spots which occasionally girdled the vines. The parasite confined its attack almost exclusively to the hypodermal tissues of the vines, although where humidity became very high the internal tissues were also involved. A

Rhizoctonia sp. was frequently isolated from *Acrothecium* lesions at the base of the vines or on vines trailing on the ground. A secondary infection of these lesions by *Rhizoctonia* evokes a soft, mushy rot at the point of penetration. Finally, the vines withered completely.

The *Acrothecium* was isolated and grew well on 2 per cent. dextrose agar and other media. Subspherical or irregular sclerotia formed profusely in the medium and measured 160 to 320 μ in diameter. Sporulation was abundant. Inoculations resulted in the production of typical leaf lesions in five to seven days. The mycelium consists of subhyaline, intra- and intercellular hyphae. Conidiophores are amphigenously produced in the central necrotic tissues, arising from substomatal, sclerotioid bodies or pushing out to the surface between dead cells. Few conidiophores were observed in dry conditions, but they abounded when the atmosphere was relatively humid. They were solitary, rigid, or slightly bent, long-septate, up to 500 or more by 19 to 15 μ.; in old cultures they turned brownish. The apex of the conidiophores was swollen with numerous tubercle-like sterigmata, bearing up to 15 or more cylindrical, olive-brown, thick-walled, single conidia, 18 to 92 by 7·5 to 15 μ. The fungus is regarded as a new species and named *A. basellae* [without a Latin diagnosis]. The parasite forms numerous sclerotia in the fallen leaves and with the advent of favourable weather these organs germinate and sporulate. Control was obtained by weekly sprayings with Bordeaux mixture 3–3–50 and 4–4–50, the stronger formula giving the better results. Dry spells checked the virulence of the pathogen, but under humid conditions spraying became necessary. The ploughing-under of infected plant debris and crop rotation are further preventive measures recommended.

Suit (R. F.). **Field results on the control of certain Grape diseases in New York.**—*Bull. N.Y. St. agric. Exp. Sta.* 712, 26 pp., 7 figs., 1945.

Field tests from 1940 to 1944, inclusive, in New York State on the control of vine black rot (*Guignardia bidwellii*), downy mildew (*Plasmopara viticola*), and powdery mildew (*Uncinula necator*) [*R.A.M.*, xxiii, p. 327] showed that Bordeaux mixture (2–2–100 to 8–8–100) effectively controlled both *G. bidwellii* and *P. viticola*, but the 4–4–100 strength is the most reliable in the hands of the growers. Excellent control of *P. viticola* and *U. necator* resulted from three applications (before, immediately after, and two weeks after, bloom) of Bordeaux mixture (4–4–100) plus 1 lb. rosin fish-oil soap, provided adequate coverage was given to the leaves and bunches. The same schedule also controlled *G. bidwellii* in 1940 and 1941, though five applications were necessary in 1944. When *U. necator* alone was present, excellent control followed two applications (immediately after and 10 to 14 days after bloom) of Bordeaux mixture (2–4–100) plus 1 lb. rosin fish-oil soap. The addition of a spreader-sticker increased disease control on the bunches but did not improve control of downy mildew on the foliage. Of the substances tested rosin fish-oil soap, S. E. C. oil (self-emulsifying cottonseed oil), spraysoy A, Grasselli spreader-sticker, and triton B-1956 proved satisfactory. Fermate (2–100) appeared to give promising results against *G. bidwellii*, of which it gave better control than did Bordeaux mixture; it was, however, less effective than Bordeaux mixture against *P. viticola*, and did not control *U. necator*. An experimental organic material, U.S.R. No. 604, was better than Bordeaux mixture against *P. viticola* and equal to it against *U. necator*. It caused some injury when used at a concentration of 1 in 100.

Hewitt (W. B.). **A graft-transmissible mosaic disease of Grapevine.**—*Phytopathology*, xxxv, 11, pp. 940–942, 1 fig., 1945.

About 60 Palamino vines grafted on St. George rootstocks in the Napa Valley of California were severely damaged in 1943 by a foliar chlorosis in which yellow,

cream, and pale green areas fell into different patterns, some of the leaves bearing narrow, cream bands along the smaller veins, irregular, cream blotches along the large veins, or a cream stippling or spattering over the surface, others being entirely yellow with only traces of green along the larger veins, while on some the pale green appeared to have originated in the veins and thence diffused into the surrounding tissue. Mixtures of the various patterns were common. The disease was experimentally shown to be transmissible, with an incubation period of four to five months, by grafting buds from infected vines on to healthy seedlings and rooted cuttings, but not by means of juice from mosaic plants. Except in its mode of transmission, the Californian disease resembles the sap-transmissible Central European vine mosaic described by Straňák *et al.* [*R.A.M.*, xi, p. 280].

Maume (L.) & Dulac (J.). **Carence potassique chez la Vigne décelée par le contrôle chimique de la feuille avant l'apparition de la brunissure.** [Potassic deficiency in the Vine disclosed by chemical analysis of the leaf before the appearance of 'brunissure'.]—*C.R. Acad. Sci., Paris*, ccxxi, 4, pp. 116–118, 1 graph, 1945.

In French vineyard plots occupied by vines in a severe state of 'brunissure' [*R.A.M.*, xvii, p. 222], some of which have been under observation for ten successive years, the potassium oxide content of the foliage is invariably below 1 per cent. of the dry matter from the time the vines are in full flower, and at the harvest it sometimes sinks below 0·3 per cent.; the leaves fall prematurely and their potassium content is literally exhausted. On the other hand, in healthy vines the potassium oxide at flowering is well above 1 and sometimes exceeds 3 per cent., while it seldom falls below 1 per cent. at the harvest. It is thus possible, by means of biochemical analyses, to detect the insidious onset of potash deficiency and take appropriate measures to replenish the soil with this element before the development of the acute symptoms of 'brunissure'.

Lauffer (M. A.) & Price (W. C.). **Infection by viruses.**—*Arch. Biochem., N.Y.*, viii, 3, pp. 449–468, 6 graphs, 1945.

The development of an equation, involving the Poisson series, applicable to the study of virus infectivity at various concentrations, is reviewed. The fundamental assumption underlying this development is that the occurrence of virus infection depends on the requisite number of virus units in the dose actually coming into contact with a susceptible region of the host. The resultant data supported the theory that the quantitative response at the various levels of dosage was, in fact, governed by the occurrence of at least one infectious unit in the dose, and a similar conclusion was drawn from the perusal of a large number of references to the subject in the relevant literature. On the other hand, an alternative hypothesis, assuming that the distribution of the number of positive responses to varying dosage levels is purely a consequence of differences in host susceptibility, was shown to be untenable.

Plantesygdomme i Danmark 1944. Aarsoversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1944. Annual survey of data collected by the State Phytopathological Experiment Station.]—*Tidsskr. Planteavl*, l, 1, pp. 1–76, 1 map, 1945. [English summary.]

This report, compiled on the usual lines, contains the following items, among many others of interest, in the sections contributed by E. Gram, H. R. Hansen, and Anna Weber [cf. *R.A.M.*, xxiv, p. 401]. Manganese deficiency was widespread early in March, generally in a mild form, on rye in Jutland. On oats and barley it was more prevalent and severe than usual in May and June owing to the enforced substitution of calcium nitrate for ammonium sulphate. In June white mustard

also developed manganese-deficiency symptoms in the form of fair-sized, sunken blotches on the leaves.

Wheat sustained heavy damage (the most extensive since 1927) from *Cercosporella herpotrichoides*, which figured in 54 out of 78 reports submitted during July. Barley was less severely attacked.

Rye ergot (*Claviceps purpurea*) was very common in some localities, sclerotia having in several instances been found occupying more than a quarter of the ears. The same crop was heavily infected on Möen and Stevns by *Ascochyta graminicola* [ibid., xxv, p. 155]; a very low phosphoric acid content of the soil was an associated factor in one field.

Clover rot (*Sclerotinia trifoliorum*) was a limiting factor in the production of red clover for seed in a number of districts [ibid., xxiii, p. 23]; an infection percentage of 80 was not infrequent, and sometimes entire stands were destroyed in the spring. Sweet clover (*Melilotus* spp.) also sustained heavy damage from the pathogen, many fields being a total loss in May and June. Anthracnose (*Kabatiella caulivora*) [ibid., xv, p. 158] killed nearly all the red clover plants in a seed field. The red clover leaf spot caused by *Stemphylium sarciniforme* [ibid., xx, p. 582] closely resembled that associated with potash deficiency except that in the former case the lesions were scattered all over the surface, causing rapid withering and blackening. By July infection had spread to lucerne, which also suffered severely from *Pseudopeziza medicaginis* in Lolland and from *Verticillium albo-atrum* in the same province and Zealand. The former pathogen in some cases defoliated the stems of one-third of the first-cut crop, while the latter damaged the roots to such an extent as to necessitate ploughing-up.

On a Zealand farm it was impossible to grow mangolds and beets for three years prior to the date of writing on account of violet root rot (*Helicobasidium purpureum*).

Potato black scurf and canker (*Corticium solani*) was exceptionally prevalent, destroying over one-third of the sprouts in some parts of Jutland. Wart disease (*Synchytrium endobioticum*) was recorded from 18 new municipalities.

Downy mildew (*Peronospora destructor*) was widespread on onions and shallots, infection originating on the latter host. Growers in Jutland undertook a voluntary inspection of the shallot fields intended for seed. The adhesion of 2 per cent. Bordeaux mixture to the leaves was greatly enhanced by the addition of 2 per cent. spraying oil, which also increased the toxicity of the treatment to the pathogen.

Diseases new to Denmark observed during 1944 included *Gloeodes pomigena* on apple, *Tuburcinia* [*Urocystis*] *gladioli* on *Gladiolus* corms [ibid., xxi, p. 258], and a species of *Physalospora* on privet (*Ligustrum*), while the following new records were published in P. Neergaard's report for 1943–4 from the Phytopathological Laboratory of J. E. Ohlsen's widow [cf. ibid., xxiii p. 427]: *Alternaria circinans* [*A. oleracea*] on seakale (*Crambe maritima*), *A. matthiolae* on ungerminated seed of *Iberis amara* and *I. umbellata*, *A. senecionis* on ungerminated seed and damped-off seedlings and leaves of cineraria (*Senecio cruentus*), *A. zinniae* [ibid., xxii, p. 389] on ungerminated seed of aster (*Callistephus chinensis*) and cineraria, and *Peronospora mesembryanthemi* on *Mesembryanthemum* sp.

Plant pathology section.—*Rep. Dep. Agric. Can., 1944–5*, pp. 29–34, 1945.

During the period under review, the only noteworthy diseases observed at the Central Laboratory, Ottawa, on intercepted shipments of imported nursery stock were an exceptionally heavy infection by *Sclerotinia narcissicola* [*R.A.M.*, xx, p. 466] in several *Narcissus* shipments from England, and a severe outbreak of a sterile fungus, probably *Rhizoctonia crocorum* [*Helicobasidium purpureum*] in two shipments of bulbous iris from the same country.

Potato bacterial ring rot [*Corynebacterium sepedonicum*: ibid., xxiv, pp. 5, 492] continued to appear in new localities, and in some instances recurred in areas where

it was thought it had been eradicated. About 60 cases were found in Prince Edward Island in 1944.

In an experiment to test the reliability of potato tuber-indexing for the detection of virus diseases, all the eyes from 16 virus-infected tubers were planted. Some eyes from two tubers gave apparently healthy plants, and of 34 affected tubers planted by the tuber-unit method (4 sets each), seven units showed some apparently healthy plants.

In seed examinations of agricultural crops, about 150 species of fungi were identified, including several new species and two new genera. Over 50 per cent. of the species identified had not before been recorded as seed-borne. Examination of 1,000 samples of vegetable seed-stocks from Great Britain and (mostly) the United States, showed that in some samples the seed was so heavily infected by parasitic fungi that it was unfit for sowing, while in most of the remainder the seed required treatment. In a greenhouse test, an application of arasan dust increased germination from 59·4 to 80 per cent. in a sample of 1944 radish seed with 58 per cent. infection by *Alternaria raphani*.

Abies balsamea specimens from Cape Breton Island showed leaf-reddening due to *Rehmiellopsis bohemica* [ibid., xix, p. 627; xxiv, p. 391], this being the first collection from Canada from which mature spores were obtained. The collection of cultures of wood-destroying fungi now comprises 1,100 named specimens, representing 312 species in 57 genera; 174 cultures still await identification. A working key to the cultural characters of these fungi accompanied by full descriptions and illustrations has been prepared, covering over 160 species.

Buchholtz (W. F.). **Diseases of small grains, Flax, and several vegetable crops in South Dakota in 1942. Diseases of cereals, Flax, and other crops in South Dakota in 1943.**—*Proc. S. Dak. Acad. Sci.*, xxiii, pp. 65–76, 1943; xxiv, pp. 98–107, 1944. [Received January, 1946.]

Particulars are given of cereal, flax, and other crop diseases in South Dakota in 1942 and 1943. Brown rust (*Puccinia rubigo-vera*) [*P. triticina*] was widespread in both years on the Thatcher and Ceres wheat varieties, the former no longer being recommended by the Minnesota Agricultural Experiment Station, where it was developed.

Flax rust and 'pasmo' (*Melampsora lini* and *Sphaerella linorum*) assumed a virulent form in 1942 and the latter also in 1943, when it destroyed the new rust-resistant varieties, Viking and Golden, in the north-east of the State.

Tomato leaf spot (*Septoria lycopersici*) caused unusually heavy defoliation in both seasons, the yield of the early, prolific Bounty and Victor varieties being drastically reduced.

Cottonwood [*Populus deltoides* and other *P.* spp.] rust (*M. medusae*) [*R.A.M.*, xxv, p. 144] developed with almost equal virulence in both years, though appearing 10 to 14 days later in 1943 than in 1942. Fully 90 per cent. of the trees in close-planted shelterbelts in the north-east succumbed to winter injury in 1942–3 following quasi-complete defoliation by the rust by 1st September, 1942. Ash rust (*P. fraxinata*) [*P. peridermiospora*: ibid., xx, p. 138] was so abundant locally in 1943 that the foliar canopy of entire plantings was brown by 15th July. Cord grass (*Spartina* sp.), the alternate host of the fungus, is widely distributed near bodies of water, hence probably the prevalence of the disease in the north-east of the State.

Wiehe (P. O.). **Division of Plant Pathology.**—*Rep. Dep. Agric. Mauritius, 1944*, pp. 11–12, 1945.

Red rot disease of sugar-cane [*Physalospora tucumanensis*: *R.A.M.*, xxi, p. 126] was more prevalent in Mauritius during 1944 than in previous years, initial infection occurring at the growth ring about one-third or half-way up the stem of the

canes, and usually on bent canes, the infection being coincident with the outer bend of the growth ring. The higher incidence in 1944 was ascribed to an after-effect of the cyclone experienced in April.

Experiments on varietal resistance and seasonal variation in the incidence of anthracnose [*Colletotrichum* sp.] on sweet potato at Union Park Sugar Estate showed the disease to be more prevalent during winter months and indicated that the varieties Raisin, Yellow, and Egyptian were more resistant. The yield, however, was poor in all cases.

Among the new records of plant diseases noted are lettuce drop and wilt of *Brassica chinensis* caused by *Sclerotinia sclerotiorum* [ibid., iv, pp. 459, 713], and leaf spot and blight of orchids (*Rhynchostylis* sp. and *Dendrobium chrysotoxum*) caused by *C. gloeosporioides*.

Forty-ninth, fiftieth, fifty-first, and fifty-second Annual Reports of the Idaho Agricultural Experiment Station, 1941, 1942, 1944, and 1945.—*Bull. Ida. agric. Exp. Sta.* 244, 63 pp., 1 graph, 1942; 251, 67 pp., 9 figs., 1943; 255, 63 pp., 1944; 264, 51 pp., 2 graphs, 1945. [Received February, 1946.]

Among the many items of phytopathological interest in these reports, besides those already covered from other sources, the following may be mentioned. A 5 per cent. lysol solution at 95° F. was the most effective disinfectant of those tested by J. M. Raeder and H. C. Kirkpatrick in 1941 for the prevention of the spread of potato bacterial ring rot (*Phytomonas sepedonica*) [*Corynebacterium sepedonicum*] by means of the cutting knife [*R.A.M.*, xxv, p. 181], followed by a commercial product, B.K. (8,000 p.p. million) and acid mercury [mercuric chloride] at the strength recommended for potato treatment. In 1942 the efficacy of B.K. for the object in view was confirmed. In 1943–4 equally good control of *C. sepedonicum* was secured by sterilization of the cutting knife in a solution of B.K. powder at a strength of 12½ level teaspoonsful per gal. water, boiling water, or semesan bel (1 in 60) in combination with a 4 per cent. solution of triton 420. A contaminated picker-type planter was shown by tests at the Aberdeen Branch Station to be much more actively concerned in the spread of ring-rot infection than an assist-feed type, the number of diseased plants in plots on which the former was used ranging from 30 to 33 per cent., compared with none in those planted by the assist-feed. In the 1944–5 trials, hot water proved more effective than therapogen (1 in 20) or B.K. (5,000 p.p.m.) solutions for the treatment of the cutting knife against ring rot, the incidence of infection in the crops from contaminated tubers held against rotating knives in their passage through the three disinfectants being 3, 20, and 32·7 per cent. respectively. When seed containing 3 per cent. diseased tubers cut with a rotary knife undergoing continuous hot-water treatment was treated in B.K. solution as it was cut, only 3 per cent. ring rot appeared in the resultant crop compared with 72·4 in the controls. *C. sepedonicum* can survive a temperature of 6° to 10° for 24 hours on a knife blade, as shown by a test in which 88 per cent. of the plants contracted the disease when healthy seed was cut with a knife dipped in macerated ring-rot tissue previously subjected to the treatment in question. In the absence of any preventive measures, the percentages of diseased plants in stands from seed containing 1, 3, 5, 7, and 9 per cent. ring rot were 58·4, 72·4, 88·9, 84, and 84·3, respectively.

Of 140 monospore isolates from *Fusarium*-wilted potatoes, 55 were tested for pathogenicity in the greenhouse in 1942 by J. M. Raeder and J. E. Kraus. On the basis of the resulting symptoms, five of the isolates were tentatively referred to *F. oxysporum* and two to *F.* [*solani* var.] *eumartii*, the identifications being confirmed by W. C. Snyder.

Three of the most promising hybrids between the Common Pinto bean [*Phaseolus vulgaris*] and Red Mexican U.I. No. 3, which are resistant to both the mosaic and

beet curly-top viruses, were selected by L. Deane and J. M. Raeder for increase in 1945 and distribution in 1946.

In 1944–5 E. C. Blodgett and G. Ken Knight devised a method of combating carrot blight [*Xanthomonas carotae*: ibid., xxiii, p. 423] by 11 to 12 minutes' submersion of the seed in a hot-water bath thermostatically controlled at 128°, agitation being effected by means of a 5-in. propeller directly connected with the drive shaft of an electric motor. The seed cage will hold about 12 lb. carrot seed, but a maximum of 5 lb. is recommended for operation. The heater (1,000-watt immersion) is inserted from below in a separate chamber opening into the main tank with a capacity of 6 gals. The treater can be operated at a capacity of 20 lb. per hour by one man. The following measures, in addition to the exclusive use of hot water-treated seed, are advocated against carrot blight: the planting of 'stecklings' on soil not previously used for the crop, or at any rate not for the past four years, the field being as far removed as possible from any carrot-seed area; and the planting of roots for the seed crop on land that has not been in carrots for at least three years and as far distant as possible from any other seed-field in which these practices have not been adopted.

G. Ken Knight grew some 1,600 tomato plants of 37 selections in [beet] curly-top resistance tests [ibid., xxii, p. 421]. Nine were highly resistant, with less than 20 per cent. of the stand diseased, and 23 moderately so (20 to 35 per cent.), while 60 per cent. of the Pritchard Bounty, and early Chatham plants used as controls were killed.

Peach leaf curl [*Taphrina deformans*], which until 1940 had been reported only from northern Idaho, has since become prevalent and severe in the south-west, where E. C. Blodgett obtained satisfactory control in 1942 by dormant applications of Bordeaux or lime-sulphur.

The major pear disease in the State is fireblight [*Erwinia amylovora*], to which the Old House, Suddeth, Tait No. 2 ,Richard Peters, and Stark Tyson proved the most resistant of 55 varieties included in E. C. Blodgett's inoculation tests in 1941.

Hall (W. J.). **The identity of a mealybug vector of 'swollen shoot' virus disease of Cacao in West Africa.**—*Bull. ent. Res.*, xxxvi, 3, pp. 305–313, 1 fig., 1945.

This is a critical discussion of the identity of *Pseudococcus exitiabilis* Laing (*Bull. ent. Res.*, xxxv, p. 91, 1944), the vector of swollen shoot of cacao in the Gold Coast [*R.A.M.*, xxiv, p. 307], based on the study of an extensive range of material from that colony, Sierra Leone, Ivory Coast, British and French Togoland, and Nigeria. It is concluded, in agreement with Laing, that *P. exitiabilis* is so closely related to *P. njalensis*, recorded on coffee from Sierra Leone (*Ann. Mag. nat. Hist.*, x, p. 472, 1929), that the two species should be united under the latter, prior name.

Schropp (W.). **Bor und Gramineen.** [Boron and Gramineae.]—*Forschungsdienst*, x, 2, pp. 138–160, 12 figs., 1940. [Received January, 1946.]

This is a review, accompanied by explanatory observations, of 72 contributions to the knowledge of the relations between the boron content of Gramineae and their state of health.

Brinton (D.). **An unusual form of epidemic food-poisoning with neurological symptoms.**—*Proc. roy. Soc. Med.*, xxxix, 4, pp. 173–175, 1946.

For 13 months from October, 1942, the population of Aden was intermittently affected by epidemics of food poisoning, which involved about 450 persons. The condition appeared to have been caused by the consumption of Abyssinian wheat shipped to Aden. This wheat was reported to contain the seed of a poisonous weed, called in the local Arabic 'miscara' (tipsy). The symptoms of the condition took

the form of dizziness, headache, lassitude, staggering gait, etc., and persisted for periods up to 72 hours; there were no deaths.

Samples of newly-wharfed Ethiopian grain were examined and found to contain up to 10 per cent. of seeds of flax-darnel (*Lolium linicolum* [*L. perenne*] or [darnel] *L. temulentum*). The poisonous element appeared to be temuline.

Andrén (F.). **Lagringsförsök med betat utsäde.** [Storage experiments with disinfected seed.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1945*, 1, pp. 1–6, 1945.

A tabulated account is given of experiments undertaken to settle various questions that have arisen in connexion with cereal seed-grain disinfection in Sweden, notably with panogen [an organic mercury compound in an oil solvent, with high spreading capacity: *R.A.M.*, xxiii, p. 380]. In a series of excess-dosage tests, the emergence of winter wheat was not appreciably impaired after eight months' storage by treatment at the rate of 175 gm. per 100 kg., while at 350 gm. it still amounted to 84 per cent. of the untreated control samples diminishing at higher dosages to 2·11 per cent. at 2,800 gm. Length of storage assumed importance as a factor in the development of injury from overdosage with panogen only at the higher rates. Rye seed treated with panogen kept somewhat better in paper bags than in closed glass containers.

Panogen appeared to lose more of its mercury content over a 15-month storage period than U.T. 1875b (uspulun dust), but the difference is of no practical importance from the fungicidal standpoint in respect of rye fusariosis [*Calonectria graminicola*] and loose smut of oats [*Ustilago avenae*]. In fact, the efficacy of both preparations was slightly enhanced at the close of the experiment.

Andrén (F.). **Resultat av betningsförsök.** [Results of disinfection experiments.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1945*, 5, pp. 69–73, 1945.

On an average, the best control of wheat bunt [*Tilletia caries* and *T. foetida*] in four seed-grain disinfection trials in Sweden in 1943–4 [see preceding abstract] was secured by dusting with U.T. 1875 b at a dosage of 200 gm. per 100 kg. and 15 minutes' immersion in 0·1 per cent. fusariol-neu. U.T. 1875 b resulted in grain yields of 4,105, 3,370, 4,309, and 3,928 kg. per ha. compared with 3,316, 2,963, 3,996, and 3,425 for the untreated controls in the four localities, the corresponding figures for fusariol-neu being 3,421, 3,444, 4,680, and 3,848, respectively.

From a table showing the incidence of barley stripe [*Helminthosporium gramineum*] over the five-year period from 1940–44 it appears that fusariol dust (200 gm.) was the most effective of the fungicides tested, reducing the average number of infected plants per 10 sq. m. from 221·7 to 0·9, the corresponding figures for panogen (200 ml.) [see preceding abstract], abavit-neu, betoxin 61, and U.T. 1875 b (all at 200 gm.), being 1·3, 1·5, 1·6, and 1·8, respectively.

Over the period from 1939 to 1943, the number of oat plants attacked by loose smut [*Ustilago avenae*] per 10 sq. m. was reduced from 134 to 0·7, 1·8, 3·4, and 9·1 by 0·1 per cent. mercuric chloride-formalin, betoxin 61, fusariol dust (both at 300 gm.), and 300 ml. panogen, respectively, the corresponding figures for 1944 being from 104·8 to 0·0, 0·02, 0·05, and 0·02, respectively.

Macindoe (S. L.). **New stem rust resistant Wheats to replace Eureka.**—*Agric. Gaz. N.S.W.*, lvi, 12, pp. 530–531, 5 figs., 1945.

In 1941, W. L. Waterhouse and I. A. Watson at Sydney University received specimens of Eureka wheat from Narrabri, New South Wales, showing stem [black] rust [*Puccinia graminis*] infection. In 1942, the author saw heavily infected crops of Eureka at Narrabri [cf. *R.A.M.*, xxiii, p. 95], and in that year a trial at Boggabri gave the following acre yields, primarily as the result of a heavy black rust epidemic: Eureka 3, Eureka (2) 6, Ford 1, Charter 34, Yalta 20, and Celebration 25 bush.

Susceptibility of the formerly highly resistant Eureka has persisted, and has been observed at Richmond and as far south as Temora, while in 1945 heavy losses from black rust were experienced by north-western growers of Eureka wheats. Researches at Sydney indicate that the Eureka wheats have become susceptible to black rust since 1942 as the result of the appearance of a new biotype of race 34 of the rust, which, however, does not so far seem to have spread to Western Australia or South Australia.

Several new black rust-resistant wheats are now becoming available. Of these, Gabo (early maturing) and Charter (mid-season to early) are recommended for general sowing in the north-west, while Kendie (mid-season), Yalta (mid-season), and Celebration (late) could be tried in small areas.

Ling (L.). **Epidemiology studies on stripe rust of Wheat in Chengtu Plain, China.**—*Phytopathology*, xxxv, 11, pp. 885–894, 1 map, 1945.

Stem [black], leaf [brown], and stripe [yellow] rusts of wheat (*Puccinia graminis*, *P. triticina*, and *P. glumarum*) are all prevalent in the Chengtu Plain, Szechuan Province, China, but the last-named is often the most important factor in the reduction of the crop. *P. glumarum* is also commonly found on *Agropyron ciliare* and *A. semicostatum* in the plain and surrounding mountains, but since it develops later in the season on these grasses than on wheat, and moreover, the two physiologic races involved were experimentally shown to differ from those on wheat [cf. *R.A.M.*, xix, p. 78], no epidemiological importance is attached to the circumstance.

The yellow rust uredospores were found to germinate best at 11·5° C., the minimum and maximum being just above 0° and 23° to 27°, respectively [ibid., xxiv, p. 141]. Under the conditions of high atmospheric humidity prevailing locally, the period of uredospore viability does not exceed one month and is usually much shorter—not more than a week. At 36° the spores only survive for two days. The winter in the Plain is so mild that the rust can easily hibernate either by means of the uredospores or mycelium, but between the wheat crops a gap of five wet, hot summer months intervenes, during which its survival is precarious. On the mountains to the westward, however, *P. glumarum* has been detected on late-sown spring wheat at 3,000 m. above sea-level throughout the summer, and thence it is conveyed south-eastwards by the wind to autumn-sown crops in the Plain. The sources of inoculum for the subsequent infection of wheat at higher altitudes are uredospores, either overwintered *in situ* or blown back from the lower levels, or both [cf. ibid., xxii, p. 198].

A study of the influence of climatic factors on the incidence of yellow rust in the Chengtu Plain from 1938 to 1944 indicated that the extent and distribution of the late winter and spring rainfall are of outstanding importance. Thus, in the only epidemic year of the seven (1939), the winter and spring rainfall amounted to 29·6 and 175·6 mm., respectively, the relative humidity from February to April to 81·3 per cent., the mean April temperature to 14·1°, and the number of rainy days from February to April to 40. In 1943, a year of relative scarcity of the disease, the corresponding figures were 13 mm., 91·1 mm., 77·2 per cent., 16·8°, and 24 days, respectively, and in 1944, another year with little rust, 21·7, 106·8 mm., 76·2 per cent., 17·5°, and 38 days, respectively, while in the other years covered by the survey the outbreaks were of intermediate severity.

Yu (T. F.), Wang (H. R.), Fang (T. C.), & Yin (S. Y.). **Preliminary studies on physiologic specialization in Tilletia tritici and T. levis in China.**—*Phytopathology*, xxxv, 11, pp. 879–884, 1945.

In the course of three years' studies on physiologic specialization in the agents of wheat bunt (*Tilletia tritici* [*T. caries*] and *T. levis* [*T. foetida*]) at the National

Tsing Hua University, Kunming, China, four races of the former (T-1 to T-4) and six of the latter (L-1 to L-6) were separated on the basis of their differential pathogenicity on the Marquis, Mindum, and 2H 80 varieties. *T. foetida* is strongly predominant in the north of the country, while *T. caries* is more prevalent in the south. Race 1 of *T. caries* is the most widely distributed in the south-west, having been found in 17 out of the 18 districts from which material was obtained and comprising 35 out of a total of 45 collections. The three test varieties were all resistant to race 1, while 2H 80 reacted similarly to races 2 and 3, which occurred, together with 1, in the north-western corner of Yunnan, where bunt is usually epidemic. The last-named variety possesses a number of desirable agronomic characters besides bunt resistance fitting it for breeding purposes. Race 4 was collected only once, from Kweichow.

The reaction of the three varieties to races 1 to 4 of *T. foetida* were identical with those evoked by the four of *T. caries*; all were immune from race 5 of the former, and Marquis and Mindum also from 6.

Rodenhiser (H. A.) & Holton (C. S.). **Distribution of races of Tilletia caries and Tilletia foetida and their relative virulence on certain varieties and selections of Wheat.**—*Phytopathology*, xxxv, 12, pp. 955–969, 1945.

Five new races of *Tilletia foetida* and two of *T. caries* are described, bringing the total number of known races to 31, of which 16 belong to the former species and 15 to the latter [*R.A.M.*, xxi, p. 284]. Three of the new races of *T. foetida* (L-13, L-14, and L-15) were identified from collections made in Mexico, L-11 originated in California, and L-12 in Virginia, while T-15 and T-16 emanated from Idaho and West Virginia, respectively. T-15 differs from the otherwise similar T-12 in the production of susceptible reactions on the Hussar, Martin, Marquis, and Canus wheat varieties. T-16 is the only race pathogenic to both Oro and Hohenheimer. L-11 is distinguishable from L-1 only by the intermediate response of Canus, which is resistant to the latter race. Albit is susceptible to L-12 and all the other winter wheat differential varieties resistant. L-13 is the only known race of *T. foetida* to which Hohenheimer is susceptible. L-14 resembles L-4 except in the intermediate effects on Martin and the susceptibility of Marquis. L-15 is separable from L-7 on the basis of its pathogenicity to Marquis and the intermediate position of Canus.

As indicated by the results of previous surveys, *T. foetida* is the predominant species throughout the United States, though *T. caries* is distributed over an extensive area, being common in the durum section of the Upper Mississippi Valley and greatly increasing in relative prevalence towards the inter-mountain region of the Northwest, where it was once preponderant [ibid., vi, p. 472; ix, p. 768; xiii, p. 86].

Tables are given showing the distribution of the 16 races identified from 62 collections of *T. caries* and of the 15 from 307 of *T. foetida*. It seems clear that the range of specific wheat varieties is the decisive factor in the prevalence of particular races within a given area, T-11 and L-8, for example, having assumed increasing prominence in those regions where Ridit and Oro, respectively, have replaced the old commercial varieties formerly serving as hosts of the more common races.

A number of wheat varieties and selections were resistant to all the races of ordinary bunt tested, viz., T 1–16 and L 1–10, the necessary factor to produce this reaction in the spring wheats apparently being supplied by the inclusion of Hope in the ancestry, while in the case of the winter types a combination of the so-called Oro and Martin factors, e.g., in Rex × Oro and Rio × Rex, provides the essential element of resistance.

Dwarf bunt constitutes a real menace to wheat production, especially in parts of Utah, Idaho, and Montana. It is increasing in importance in the State of Washington,

and has been observed in Wyoming, Colorado, and New York. The Relief, Cache, and Wasatch varieties, though resistant to dwarf bunt [ibid., xxii, p. 472], are susceptible to a few races of the ordinary forms of the fungi, leaving the problems still outstanding of combining the factors in such a way as to confer resistance to both types.

Dillon Weston (W. A. R.) & Taylor (R. E.). **Seed disinfection.**—*J. agric. Sci.*, xxxv, 4, pp. 239–242, 1 fig., 1945.

The following results of experiments in seed-grain disinfection are recorded: substantial control of bunt of wheat (*Tilletia caries*) was obtained by treating seed with an approved organo-mercury seed disinfectant, using three mixing machines, a hand-operated rotational type, a gravity-feed type, and a modification of the latter designed by the authors to give greater efficiency. Using 200 lb. Little Joss wheat with a germination capacity of 99 per cent., mixed with 1 lb. *T. caries* spores, the mean percentage of infection and the variance for each treatment were, respectively, 3 and 2·4 for the rotational machine, 6·2 and 3·5 for the modified gravitational, 9·6 and 13·1 for the gravitational, and 87·8 and 12·2 for the control. Good control of leaf spot of oats (*Helminthosporium avenae*) was obtained when using a scale model of a proprietary rotational-type machine, the working capacity of the commercial type being 1 bush., and that of the model 1½ lb., the oats, infected with *H. avenae*, being mixed with an approved organo-mercury seed disinfectant, and rotated 3, 6, 12, 24, and 48 turns (five replications). The efficiency in terms of the variance of percentage infection and mean percentage of infection for each treatment were, respectively, for no rotation (control) 7·92 and 18·80, for three rotations 31·49 and 18·80, for 12 rotations 9·21 and 3·60, for 24 rotations 4·40 and 3·01, and for 48 rotations 1·34 and 1·89. The variance ratio required for significance was 19 : 1 level = 2·15 and 99 : 1 level = 2·98, and the corresponding differences between means required for significance being 1·72 and 2·34. Thus, even mixing of grain and seed disinfectant was obtained with as few as 48 rotations, the mixing being much less even at 24 turns, although almost as effective. The gravitational machine was not so efficient in producing an even mixing as the rotational, as assessed by the control of *T. caries* and it appeared that the latter gave better disease control; the addition of a felt lining to the feed-hopper of the gravitational machine effected an improvement in its mixing efficiency.

Angell (H. R.). **Unavailability of plant food and take-all of Wheat.**—*J. Coun. sci. industr. Res. Aust.*, xviii, 1, pp. 37–46, 1945.

The results of the author's experiments, carried out from 1941 to 1943, inclusive, at Canberra, on the relation of plant nutrition to wheat take-all (*Ophiobolus graminis*) have already been noticed from other sources [*R.A.M.*, xxiv, pp. 91, 402].

De Tempe (J.). **Alkaloidvorming door Claviceps purpurea (Fr.) Tul. in saprophytische cultuur.** [Alkaloid formation by *Claviceps purpurea* (Fr.) Tul. in saprophytic culture.]—Thesis, Univ. Amsterdam, 84 pp., 1945. [English and German summaries.]

Of the 18 strains of *Claviceps* from the Centraalbureau voor Schimmelcultures, Baarn, used in the writer's experiments on alkaloid production by the fungus in saprophytic culture, 15 were determined as *C. purpurea* (11 from Dutch rye [*R.A.M.*, xxv, p. 64], one from German rye, and one each from American *Poa pratensis*, *Festuca elatior*, and *Bromus inermis*), the sixteenth from *Glyceria borealis* (United States) as *C.* (?) *wilsoni* [loc. cit.], the seventeenth, from an unknown host in Switzerland, as *C. microcephala* (identified by J. Krebs) [loc. cit.], and the eighteenth as *C. paspali* [ibid., xxiv, p. 233] on *Paspalum leve*

(United States). The last-named was the only one to form an occasional trace of alkaloid on the media selected for the trials, viz., asparagin-saccharose agar, neutralized beer wort agar, and rice. Further tests were carried out on hundreds of the author's own isolates from Spanish, Dutch, Canadian, Polish, and Hungarian ergot, of which the first-named provided twice as high a percentage of alkaloid-forming cultures as all the rest together. However, owing to the rapid loss of the alkaloid-producing capacity with advancing age, it was useless to select strains showing an initial high capacity in this direction.

In peptone-maltose cultures the *C.* spp. made scantier growth than in asparagin-saccharose, but their alkaloid output, expressed by the development of a red coloration on staining with Van Urk's reagent (*Pharm. Weekbl.*, lxvi, p. 473, 1929), was heavier on the former than on the latter substratum, which promoted deterioration. This tendency was to some extent counteracted by the addition to the asparagin-saccharose of tertiary instead of secondary calcium phosphate. Apart from the disparities in their alkaloid yield, the experimental isolates showed marked differences in growth habit, colour, spore and pseudosclerotial formation, and other characters. The large discrepancies in the dry weights, even of identical cultures, may be caused by the influence on the floating capacity of the spores of minute quantities of substances which alter the surface tension, since only floating spores take part in the formation of the fungus mat. The average alkaloid production of measurable positive cultures with 50 c.c. asparagin-saccharose, analysed two days after removal of the mats, was 0·36 mg. in the mat (of which 0·07 mg. was water-soluble) and 0·07 mg. in the filtrate, the corresponding maxima being 1·50, 0·21, and 0·90 mg., respectively [cf *R.A.M.*, xix, p. 273; xxv, p. 64]. The addition of small amounts of alkaloid to the cultures neutralized the tendency to deterioration referred to above. Crude vegetable extracts, e.g., yeast, beer wort, roots, potato, and rye, exerted a stimulating effect on the growth rate of the cultures but did not promote alkaloid production, negative results in this direction likewise following the use of indole-containing and other nitrogenous substances. Strong sunlight exerted a very adverse effect on the cultures. No alkaloids were produced in cultures subjected to regular shaking. No advantage in respect of alkaloid production was derived from the use of mono-ascospore, conidial, or combined cultures in place of those from sclerotial fragments. This fact, taken in conjunction with the outcome of inoculation experiments on rye, is interpreted as confirming Killian's view (*Bull. Soc. mycol. Fr.*, xxxiv, p. 182, 1918) that *C. purpurea* is homothallic.

Polyploidization of *C. purpurea* appears to be practicable by means of exposure to camphor or acenaphthene, but clones with greatly increased average conidial dimensions generally reverted in a few months to the normal size, and furthermore, they presented no superiority over untreated material for purposes of alkaloid production in saprophytic culture.

Schweizer's method of cultivation of *C. purpurea* on cold sterilized nutrient media [*R.A.M.*, xxi, p. 70] was found to be very laborious, and the fungus did not develop satisfactorily on rye emulsions prepared in this manner.

Throughout the investigation no single factor could be found to induce alkaloid formation even by strains theoretically capable of the process.

Viégas (G. P.). **Tratamentos de sementes de Milho.** [Treatment of Maize seed.]—*Bragantia, S. Paulo*, v, 2, pp. 145–151, 2 graphs, 1945.

None of the fungicides, viz., uspulun dust, semesan jr., and abavit dust (all at 0·2 per cent.), and granosan (0·1 per cent.), applied to three maize varieties, Armour, Itaici, and Catêto, in a five-year series of experiments at the Agronomic Institute, Campinas, São Paulo, appreciably improved germinability or controlled [unspecified] ear rots, and only the first-named produced any consistent increases of yield.

Bitancourt (A. A.). **O falso exantemo dos Citrus.** [False exanthema of Citrus.]—*Biológico*, xi, 10, pp. 266–268, 1 fig., 1945.

A citrus disease characterized by symptoms corresponding to those described by L. Kung-Hsiang from China under the name of 'convex gum' [*R.A.M.*, xxii, p. 384] is reported to be present in São Paulo, Brazil, where it is known as 'false exanthema'. Infection has been observed on material imported from Japan.

De Andrade (D. X.). **A 'tristeza' dos Citrus.** [Citrus root rot.]—*Bol. Agric., Pernambuco*, xii, 1, pp. 45–48, 1945.

So far the form of citrus root rot associated with the use of sour orange stocks for grafting [*R.A.M.*, xxv, p. 111] has not been observed in Pernambuco, Brazil, but its occurrence in São Paulo [ibid., xxiv, p. 410] constitutes a threat to growers in the former State, where specimens of any suspected material should be submitted to experts of the Ministry of Agriculture for diagnosis and sweet orange stocks used in preference to sour.

Childs (J. F. L.) & Siegler (E. A.). **Controlling Orange decay.**—*Industr. Engng Chem.*, xxxviii, 1, pp. 82–87, 1946.

Thiourea and thioacetamide in 5 per cent. and quinosol in 8 per cent. aqueous solution, applied as momentary dips, reduced the incidence of stem-end rots (*Diplodia natalensis* and *Phomopsis* [*Diaporthe*] *citri*) and blue and green moulds (*Penicillium italicum* and *P. digitatum*) in Florida orange fruits of commercial varieties [*R.A.M.*, xxiv, p. 447], such as Parson Brown, Pineapple, Seedling, and Valencia, from 40 to 2 per cent. or below. Equally good results were obtained in commercial trials in which 5 per cent. thiourea or thioacetamide was incorporated in the water phase of wax emulsions used as coatings for the fruit. Similarly, 5 per cent. quinosol or thiourea was highly efficacious when applied to the oranges before coating by the solvent wax process. The fungicidal activity of the compounds under investigation is closely linked with their penetration into the fruit tissues, in which the presence of thiourea was demonstrated. The inclusion of both sulphur and amino groups in the molecule appears to be essential to the success of the thiourea and thioacetamide dip treatments. Conflicting results were given by tests with 2-aminothiazole.

Hendrickx (F. L.). **Sur les fructifications conidiennes de Glomerella cingulata (Stonem.) Spauld. et v. Schr. (Sphaeriaceae).** [On the conidial fructifications of *Glomerella cingulata* (Stonem.) Spauld & v. Schr. (Sphaeriaceae).]—*Rev. Agron. colon.*, ii, 3, pp. 28–30, 1945.

The author's study on the conidia of *Glomerella cingulata*, the agent of coffee anthracnose in the Belgian Congo, has already been noticed from another source [*R.A.M.*, xxiv, p. 412].

Arragon (G.), Mainil (J.), Refait (R.), & Velu (H.). **Dissociation d'Eremothecium ashbyii Guilliermond.** [Dissociation of *Eremothecium ashbyii* Guilliermond.]—*C.R. Acad. Sci., Paris*, ccxx, pp. 65–67, 1945.

Details are given of the development of variations in the white, yellow, and orange pigmentation of *Eremothecium ashbyii* [*R.A.M.*, xxiv, p. 448] induced by transference from one medium to another and different methods of culturing, e.g., starting from giant colonies or a physiological serum composed of fragments of mycelium and spores. Such changes do not persist when the cultures are retransferred to potato decoction or beer wort agar. The type of dissociation under observation is analogous to that described by Mackinnon in connexion with *Candida albicans* [ibid., xix, p. 344].

Velu (H.), Refait (R.), Arragon (G.), & Mainil (J.). **Sporulation d'Eremothecium ashbyii Guilliermond, et dissociation du type.** [Sporulation of *Eremothecium ashbyii* and dissociation of the type.]—*C.R. Soc. Biol., Paris*, cxxxix, 13–14, pp. 662–663, 1945.

Carrot decoction agar was found to be a very suitable medium for the sporulation of *Eremothecium ashbyii*, a spore suspension of which in physiological serum, subcultured on Renaud's bouillon with agar, dissociated into white, yellow, and orange colonies, as already observed in cultures arising from a mixture of mycelium and spores [see preceding abstract].

Kessel (E. L.) & Kessel (Berta B.). **Diptera associated with fungi.**—*Wasmann Collector*, iii, 3, pp. 73–92, 1939. [Received March, 1946.]

This paper comprises the writers' original observations in California on the relationships between flies and fungi and a complete list of the known partnerships, followed by bibliographical references.

Loughnane (J. B.). **A seedling disease of Flax caused by Macrosporium sp.**—*Nature, Lond.*, clvii, 3983, p. 266, 1946.

A sample of Newlands flax seed received in Dublin in 1944 and characterized by the dull colour of a very large proportion of the seed was sown in pots in a glasshouse. The cotyledons of some of the resulting seedlings developed brown lesions, usually near the margin, but sometimes present as minute spots near the centre. When the affected seedlings were kept in a moist atmosphere the cotyledons died and became covered with an olivaceous mould. The fungus spread to the hypocotyls of the diseased seedlings and to the hypocotyls and cotyledons of healthy ones in contact with them. Such seedlings in most cases rapidly succumbed.

The fungus showed club-shaped [? obclavate], light brown, muriform, 6- to 12-septate conidia, borne singly or in pairs on the ends of short, straight, light brown, septate conidiophores. The conidia, identified as belonging to a species of *Macrosporium* [*Alternaria*], ranged from 60 to 105 μ long (excluding the beak which averaged 75 μ) by about 25 μ broad at the widest point. The fungus appeared to be carried as mycelium in the seed coat.

Healthy flax seedlings were rapidly killed by inoculation with conidia from a pure culture of the fungus, the radicles, hypocotyls, and cotyledons being invaded and destroyed.

A similar fungus was found on a diseased crop of Buda flax and on seed from the lot from which this crop had been grown. Dead flax seedlings of an unknown variety also yielded the same fungus. Observations demonstrated that the organism is favoured by high atmospheric humidity. This appears to be the first record both of the disease and of the fungus. Further work is in progress.

Vallega (J.). **Especialización fisiológica de Melampsora lini, en Argentina.** [Physiologic specialization of *Melampsora lini* in Argentina.]—*An. Inst. fitotec. S. Catalina, 1942*, iv, pp. 59–74, 1944. [English summary.]

From 1939 to 1941 the presence in Argentina of physiologic races 19, 20, 22, 42, and 42 A of flax rust (*Melampsora lini*) [*R.A.M.*, xx, p. 18] was demonstrated by means of inoculation experiments with uredospores from leaves collected in different parts of the country. Races 42 and 42 A have not hitherto been described. The former infects all the differential varieties listed by Flor [ibid., xix, p. 655] except Bombay, and the latter all but Bombay and Argentine C.I. 705. Of all the races of *M. lini* so far distinguished, 42 attacks the largest number of varieties, mostly in a very severe form. Among over 200 indigenous and foreign varieties and selections tested, all those of the former group were susceptible to the races prevalent in the country, while of the latter (fibre or intermediate type), Saginaw ×

Bombay C.I. 671 was immune from all, J.W.S.C.I. 708, T. Tammes C.I. 332, and T. Tammes 766 susceptible only to 42 and 42 A, and Vologda, Leningrad, Pensa, and others resistant to 19. Foreign linseed strains resistant to the rust included Ottawa 770 B.C.I. 355 (races 19 and 20), Italia Roma 2090 and Usigus Sind Karachi 2864 (19, 20, and 22), and Bombay C.I. 42, Punjab C.I. 20, and Indian Types 29 and 46, immune from all races occurring in Argentina, these Indian selections being of great importance from the breeding standpoint.

The results of the present work, together with those obtained by Flor [ibid., xix, p. 655], Straib [ibid., xviii, p. 679], and Waterhouse and Watson [ibid., xxi, p. 256], show that the race populations of Argentina, the United States, Germany, and Australia are entirely different and within each geographic population the races possess common characters indicative of their origin.

Severin (H. H. P.) & Freitag (J. H.). **Additional ornamental flowering plants naturally infected with California Aster yellows.**—*Hilgardia*, xvi, 12, pp. 599–618, 6 pl., 4 figs., 1945.

The host range of the California aster yellows virus [a strain of aster yellows virus] among ornamental flowering plants naturally infected includes 45 species and one interspecific hybrid in 38 genera belonging to 17 families, including those previously reported [*R.A.M.*, xxiii, p. 20]. Previously non-infective short- and long-winged aster leafhoppers (*Macrosteles divisus*) transferred the virus from naturally infected plants to healthy celery and asters, respectively. Noticeable symptoms, which vary with the size of the plant when infected, include stunting, internodal shortening, production of axillary shoots from the bud normally dormant in the axil of each leaf, upright or vertical position of the leaves and stems, cleared venation, cupping, twisting, and chlorosis of the leaves. The most striking symptoms are phyllody (the tendency of the floral organs to resemble leafy structures), virescence, and proliferation of the flowers.

Frazier (N. W.) & Severin (H. H. P.). **Weed-host range of California Aster yellows.**—*Hilgardia*, xvi, 12, pp. 621–650, 4 pl., 1945.

Of the leafhopper vectors of the Californian aster yellows virus [see preceding abstract] the short-winged aster leafhopper (*Macrosteles divisus*) completed its life-cycle on 19 species of weed hosts; the long-winged aster leafhopper (*M. divisus*) on 25, the mountain leafhopper (*Colladonus montanus*) on 27, and the geminate leafhopper (*Idiodonus geminatus*) on 28.

In inoculation experiments, 25 species of weeds in 24 genera belonging to 14 families were infected by means of one to four vectors, including 22 annuals, two biennials, and one perennial, with this strain of the aster yellows virus, which was transferred by short- or long-winged aster leafhoppers, previously non-infective, from the infected weeds to asters. Symptoms of aster yellows appeared in six species of inoculated weeds, but the virus was not isolated from them. The symptoms partially disappeared in some species.

Weeds of 41 species in 31 genera of 14 families were shown to be naturally infected with California aster yellows virus, including 28 annuals, five annuals or biennials, four biennials, and four perennials, the virus being transferred to asters by previously non-infective leafhoppers. Five other weed species developed characteristic aster yellows symptoms in nature, but it was not found possible to recover the virus from them. It passes the winter in annual, biennial, and perennial weeds and in the leafhopper vectors.

Kunkel [*R.A.M.*, vi, p. 297] was unable to infect Leguminosae with the New York aster yellows virus [aster yellows virus], but in these experiments three species of weeds of this family proved susceptible to the Californian strain of the virus. This difference in host range may constitute another difference between these strains.

Overlapping host ranges of the two viruses include three species of weeds belonging to two families.

Campi (Maria D.). **Ensayo comparativo de la eficacia de tres fungicidas sobre la enfermedad del Clavel producida por Heterosporium echinulatum (Berk.) Cke.** [Comparative assay of the efficacy of three fungicides against the Carnation disease caused by *Heterosporium echinulatum* (Berk.) Cke.]—*Publ. Misc. Minist. Agric., B. Aires*, Ser. A, ii, 11, 12 pp., 1 graph, 1946.

Of three fungicides tested for their toxicity to *Heterosporium echinulatum* [*Didymellina dianthi*] on the very susceptible Betty Lou carnation variety under glass at the Plant Quarantine Station, J. C. Paz, Buenos Aires, Argentina, in 1943, only lime-sulphur (1° Baumé) gave effective control. The plants situated in the dry and sunny quarter of the greenhouse responded much more favourably to treatment at three-weekly intervals than those on the damp, shady side receiving weekly or fortnightly applications.

Mosnat (H. R.). **Control of Lily disease.**—*Horticulture*, xxiii, 18, p. 458, 1945.

In 1944 the writer successfully combated blight (*Botrytis*) [*elliptica*] on Formosan lilies [*R.A.M.*, xxii, p. 434] in Iowa by spraying with dithane [disodium ethylene bisdithiocarbamate; ibid., xxv, p. 149] at the rate of 5 oz. per 5 gals. water, with the addition of $\frac{3}{4}$ oz. zinc sulphate (36 per cent. zinc) and $\frac{3}{8}$ oz. hydrated lime. The same formula was effective against [unspecified] blights of *Phlox*, *Chrysanthemum*, and *Liatris*.

Lihnell (D.). **Försök rörande vissnesjuka hos Azaleor.** [Experiment relating to Azalea wilt disease.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1945*, 5, pp. 65–69, 3 figs., 1945.

From wilted azalea [*Rhododendron*] plants imported into Sweden the writer isolated *Cylindrocarpon radicicola* [*R.A.M.*, xxii, p. 319] and inoculated four strains of the fungus grown on sterilized oats into 18 one-year-old plants each of the Mme Petrick, Paul Schäme, and Pink Pearl varieties and an unnamed sort. The number of successful tests was much higher on wounded than on uninjured plants (30 as compared with 7 for all four cultures). The development of the fungus is promoted by deep planting, heavy shade, excessive watering, and abrupt fluctuations of temperature.

Jones (F. R.). **Winter injury and longevity in unselected clones from four wilt-resistant varieties of Alfalfa.**—*J. Amer. Soc. Agron.*, xxxvii, 10, pp. 828–838, 1945.

Small clones of unselected lucerne plants of the wilt [*Corynebacterium insidiosum*]-resistant varieties, Ladak, Hardistan, Orestan, and Ranger, were grown for five years in a Wisconsin nursery with a cutting schedule and methods of cultivation designed to favour longevity [*R.A.M.*, viii, p. 110; xxiv, p. 192]. Early in the fifth summer (1944) between a quarter and half the clones were dead, and about half the survivors in poor condition.

Despite the comparatively mild winters during the experimental period, a few clones had been winter-killed, while among the diseases present, bacterial wilt and downy mildew (*Peronospora trifoliorum*) had selectively destroyed susceptible clones. However, these pathogens, together with winter injury, appear to have killed only about half the dead clones and were not primarily responsible for the unthriftiness of the living ones. The other parasitic diseases, leaf spot (*Pseudopeziza medicaginis*) and black stem (*Ascochyta imperfecta*), and insect pests present in the nursery do not seem to have been sufficiently selective in their action to account for the destruction or deterioration of so many of the clones. The unsatis-

factory performance of the clones must, therefore, be attributed in the main to winter injury of widely varying character and extent, some forms involving stunting of the tops and others reduction in the number of stems from bud-killing, with or without more or less serious damage to the root and crown decay. Leafhopper (*Empoasca fabae*) infestation and fungal infection are believed to have retarded the effectual recovery from winter injury, but the evaluation of such relationships must await the critical study of properly selected material. Meanwhile, winter injuries and their consequences in clones under field conditions appear to be sufficiently well-defined to serve in the selection, at any rate for local needs, of longer-lived strains of lucerne.

Weimer (J. L.). **A new species of Colletotrichum on Vetch.**—*Phytopathology*, xxxv, 12, pp. 977–990, 4 figs., 1945.

Vetches (*Vicia* spp.) in Florida and Georgia are subject to infection by an anthracnose causing the development on the leaves of roughly circular, elliptical, or angular, pale green, whitish or yellow-olive lesions, gradually fading to light brown, grey or nearly white, with a narrow Brussels brown, raw umber, bay, or warm sepia border, which measures 1 to 2 mm. in diameter. The linear, pale green lesions on the young stems and petioles, 1 to a few mm. in length by less than 1 mm. in width, darken with age, usually to warm sepia, and tend to coalesce with adjacent spots over large areas. Under humid conditions severe defoliation and death of the young stems may occur.

The fungus responsible for this disease, which is named *Colletotrichum villosum* n.sp., grows slowly on non-acid media only, maize meal, oatmeal, and 2 per cent. dextrose agars and fresh, green string-bean pods being particularly favourable for conidial production. It is characterized by a white, later dark brown, thick-walled, multiseptate mycelium, amphigenous acervuli, 25 to 100, commonly 30 to 50 μ in diameter, grey to warm or ochraceous-buff conidial masses, hyaline to purple-grey or red-brown, uni- to quadriseptate setae, 45 to 150 by 6·3 to 9·5 (average 85 by 7·5) μ (sometimes absent), and hyaline, unicellular, bluntly tapering conidia, 15 to 24 by 3·5 to 4·5 (18·9 by 4) μ. The minimum, optimum, and maximum growth temperatures are 3·5°, 24° to 26°, and near 32° C., respectively. *V. atropurpurea*, *V. villosa*, and *V. dasycarpa* were the most susceptible of the species tested, *V. sativa*, *V. grandiflora*, *V. monanthos*, *V. angustifolia*, and *V. pannonica* being comparatively resistant. Control measures should be based on the use of healthy seed, crop rotation, and the cultivation of resistant varieties.

Vang (J.). **Typhula species on agricultural plants in Denmark.**—Reprinted from *Aarsskr. VetHøjsk., Kbh., 1945*, 46 pp., 18 figs., 4 graphs, 1945.

The studies under discussion were carried out on herbarium material from the Copenhagen Botanical Museum, fresh field specimens, and pure cultures of *Typhula* spp. from the Centraalbureau voor Schimmelcultures, Baarn, Holland.

J. Lind reported (Danish Fungi, 1913) the following species as of phytopathological importance in Denmark: *T. gyrans* on cabbage, *T. betae* on beet, *T. variabilis*, *T. graminum* on grasses, and *T. trifolii* on clover. The fungus isolated from semi-decayed swede petioles produced brown to black sclerotia, 0·5 to 2 mm. in diameter, with a medulla of prosoplectenchymatous hyphal tissue with large, irregular cells just below the cortex, which is about 12 μ thick, rough, and consists of a gelatinous, quasi-homogeneous layer. The unbranched fruit body is whitish, 1·5 to 2 cm. or more in height, of which one-quarter to one-third is occupied by the fusiform clavula. The basidia are clavate and furnished with four sterigmata, and the ellipsoid basidiospores measure 6 to 9 by 3 to 4 (average 8·1 by 3·3) μ. From the anatomical structure of the sclerotia the author concludes, in agreement with Ruth Remsberg [*R.A.M.*, xix, p. 434], that the *Brassica* pathogen should be referred to

T. variabilis Riess and not, as heretofore, to *T. gyrans* (Batsch) Fr. (*Sclerotium semen* Tode). Further support was lent to this opinion by an examination of the herbarium specimens assigned by E. Rostrup to *T. gyrans*. However, since *S. semen* (1790) is not the oldest name of the fungus, which had already been described as *Lycoperdon brassicae* by Bergius in 1765, it is proposed to re-name it *T. brassicae* (Berg. ex Fr.) n. comb. with *T. variabilis* as a synonym.

The sclerotia of *T. brassicae* germinate with fertile fruit bodies after six months' dormancy under the influence of light. The optimum temperature for mycelial growth was found to be about 16° C. and the maximum 21°, while the sclerotia develop most rapidly just below the optimum. The latter organs occur singly or in small groups in concentric rings round the inoculum. A drop of clear liquid appears on their surface during growth but is no longer perceptible at maturity. The entire period of development occupies from 10 to 12 days. On agar cultures many sterile structures resembling fruit bodies are formed, usually from the sclerotia, though they may arise directly from the adpressed white, later brownish mycelium. They are white, simple or slightly branched towards the apex, phototropic, and up to 8 by 0·5 cm. After ten days a few fertile fructifications developed among the many sterile ones in Petri dishes from a thermostat room, but the former were absent from cultures kept in the dark. Like J. A. MacDonald in Scotland [ibid., xiv, p. 279], the author failed to infect turnips with pure cultures of *T. brassicae*, and his tests on fodder and sugar beets, swedes, carrots, and potatoes were similarly unsuccessful. In Denmark the fungus is most commonly found on swedes and turnips in silos, and may contribute to the spread of decay incidental to defective methods of ensilage, but neither here nor in other northern countries can it be regarded as a dangerous parasite, though reports of severe infection on sugar beets are forthcoming from southern countries, such as Spain [ibid., xii, p. 416], Italy (also on potato) [ibid., viii, p. 597], and the Azores [ibid., vi, p. 80].

T. betae Rostr. [ibid., xiv, p. 548] is also referred to *T. brassicae* on the basis of its sclerotial anatomy and physiological characteristics. It is of common occurrence in Denmark on stored fodder and sugar beets, mostly in association with other fungi, e.g., *Botrytis cinerea* or *Phoma betae*, and bacteria, or under improper ensilage conditions. The fresh material examined consisted of sclerotia from mangold petioles.

Previous investigations on *T. itoana* Imai (*T. graminum* Karst. sensu Erikss. *et al.*) [ibid., xix, p. 434] are reviewed. The writer's experience with the fungus was limited to a temperature test, the results of which agreed with those obtained by Tasugi in Japan [ibid., xiv, p. 568] and Volk in Germany [ibid., xvi, p. 803], the optimum for mycelial growth being about 10°. Growth is stimulated by darkness and high atmospheric humidity. There are few records of damage to grasses by *T. itoana* in Denmark, where the last record of an attack (on wheat) dates from 1923. Ekstrand is of opinion that in Sweden the fungus is often confused with snow mould (*Fusarium nivale*) [*Calonectria graminicola*: ibid., xxv, p. 103], and the same may be true of Denmark.

The supposed connexion between *S. rhizodes* and *T. itoana* has been disproved [ibid., x, p. 191; xviii, p. 34]. The sclerotia of the two fungi and their symptoms on grasses are very similar, but *S. rhizodes* attacks its hosts at a much later stage of growth than *T. itoana*. The former has been collected in Denmark on *Baldingera arundinacea* and *Calamagrostis lanceolata*. Whetzel places it more correctly in *Rhizoctonia*.

T. trifolii Rostr. was found to grow best between 13·9° and 16·1°. Its mycelial development closely resembles that of *T. brassicae*, but its sclerotia, though fewer, are rather larger than those of the foregoing and blacken more rapidly. Like *T. itoana*, it may be connected with the snow mould and so belong to the group of fungi responsible for winter injury [ibid., xviii, p. 299], but there is no reason to regard it as a primary parasite.

Of the 14 species of *Typhula* enumerated by Lind [loc. cit.] as present in Denmark, only the three discussed in this paper are considered to be of economic importance.

Blodgett (E. C.). **Diseases of small fruits in Idaho.**—*Bull. Ida. agric. Exp. Sta.* 246, 27 pp., 19 figs., 1942. [Received February, 1946.]

This useful compilation presents the available information on the distribution, importance, causes, symptoms, and control of the fungal, bacterial, virus, non-parasitic, and miscellaneous diseases of small fruits in Idaho.

Common fungus diseases of fruit trees in South Australia.—*J. Dep. Agric. S. Aust.*, xlix, 4, pp. 158–161, 4 figs., 1945.

In this paper, the first of a series, compiled by Officers of the Horticultural Branch of the South Australia Department of Agriculture, a simple key is given to the diseases affecting stone fruit trees, followed by brief, practical notes on the symptoms and control of 'curl leaf' (*Taphrina deformans*) and shot hole (*Coryneum beijerinckii*) [*Clasterosporium carpophilum*] of stone fruits.

Willison (R. S.). **A line-pattern virosis of Shiro Plum.**—*Phytopathology*, xxxv, 12, pp. 991–1001, 3 figs., 1945.

The line-pattern virosis [peach line-pattern virosis virus] previously observed on Shiro plums [*R.A.M.*, xxii, p. 10] was transferred by budding at the Dominion Laboratory of Plant Pathology, St. Catherines, Ontario, to Shiro, Abundance, Early Golden, Imperial Gage, Reine Claude, Lombard, and Grand Duke plums, Italian and German prunes, myrobalan (*Prunus cerasifera*) seedlings, Elberta, Rochester, and seedling peaches, Niagara apricots, Black Tartarian and Napoleon cherries (*P. avium*), Montmorency cherry (*P. cerasus*), and *P. mahaleb* seedlings. There were considerable variations in the intensity of the symptoms induced, the patterns being virtually absent, for instance, from Early Golden and Imperial Gage plums, barely perceptible and translucent in Italian prunes and Reine Claude, and brilliant yellow to white in Shiro and some *P. cerasifera* seedlings; the relatively few affected leaves on Lombards frequently became necrotic. The inoculated peaches usually developed pale green, irregular lines, rings, and veinbanding, while faint, green rings and lines and yellowish to white patterns were found on Black Tartarian and Napoleon cherries; diffuse, pale streaks, spots, and rings, and slight necrosis on Montmorency in the first season and narrow, translucent lines in the second; green rings and lines and short, yellow, later necrotic streaks along the veins on *P. mahaleb*; and the reactions of apricots were negative.

Lott (T. B.). **'Lambert mottle', a transmissible disease of sweet Cherry.**—*Sci. Agric.*, xxv, 12, pp. 776–779, 1 fig., 1945.

In 1939 symptoms, previously unobserved but suggestive of mottle leaf, appeared in four experimental Lambert sweet cherry trees in the grounds of the Summerland Laboratory, British Columbia. Surveys of over 9,000 cherry trees revealed only nine Lambert trees with the characteristic symptoms.

The terminal shoots of trees in which the disease is well established appear normal in early spring but, as the season advances, all the upper buds either fail to move, or swell a little and then die. The development of the other leaf buds and of the flower buds is both late and irregular. In early summer, the foliage appears slightly thin, but individual leaves are normal in appearance except that some are below full size. In early June a slight yellow interveinal mottle begins to appear on the older leaves, and is soon followed by numerous small spots of a purplish or chocolate colour which later becomes brown, and forming lines beside the veins and rings without relation to the latter, the spots being surrounded by faint areas of greenish yellow. In addition to these symptoms, and possibly unrelated to them, leaf areas

up to 3 cm. long, which become brown and torn, are observable. In midsummer, the basic normal green of the oldest leaves changes to yellow, and the greenish yellow pattern becomes slightly darker. Premature defoliation, beginning in July, may cause a loss of half the leaves. Branching resulting from new shoots from some way down the previous season's growth is at all times a characteristic symptom. In all these circumstances a light crop results with many fruits failing to reach maturity. The disease becomes progressively more serious for several years, necrosis of the twigs and larger branches occurs, and there are indications that young trees may die prematurely. In older trees the disease, to which the name 'Lambert mottle' is given, appears to become stabilized.

'Lambert mottle' has been transmitted to 17 Lambert trees successfully in every case, six times from Bing tissue and eleven from Lambert tissue. It has also been transmitted to Lambert from a Napoleon source in Nelson containing mottle leaf also and three Lambert sources in the Okanagan valley containing 'Lambert mottle' only; attempts to transmit the disease from these four sources and one other Lambert source to 27 Bing trees and 14 of Napoleon produced no visible effect. Diseased Lambert branches grew in some of these trees for years without showing symptoms. Normal Bing buds set on a diseased Lambert tree produced branches which grew normally till the Lambert tree was nearly dead. Some of the Bing leaves then showed a few rather bright yellow ring spots and 'Lambert mottle' was transmitted to two Lambert trees from buds taken from these Bing branches.

From these and further experiments it is concluded that 'Lambert mottle' and mottle leaf [*R.A.M.*, xxiii, pp. 391, 392] are both transmitted by budding and grafting, the former virus producing marked symptoms on Lambert trees and no visible reaction in Bing or Napoleon; whereas the latter induces pronounced symptoms on Bing and Napoleon and but little effect on Lambert. In double infections the symptoms depend upon the variety, only one disease becoming visible and the other being without effect.

Winter (A. G.). **Virusartige Erkrankungen der roten Johannisbeeren (Ribes rubrum).** [Virus-like diseases of Red Currants (*Ribes rubrum*).] –*Z. PflKrankh.*, 1, 10, pp. 512–520, 7 figs., 1940. [Received January, 1946.]

For two years prior to the time of writing, red currants in the fruit-growing district of the foothills round Bonn, Germany, were observed to be suffering from a virus-like complex provisionally divisible into two main groups and in no way reminiscent of Hildebrand's mosaic [*R.A.M.*, xviii, p. 536]. Group (1) comprises plants in which (*a*) the long shoots cease growth after the production of a few (6 to 10 instead of the normal 20 to 30) leaves at the beginning to middle of May instead of continuing until mid-June, the cessation of growth being accompanied by a pronounced shortening of the internodes, so that the terminal bud is surrounded by a 'whorl' of three large leaves. Another feature (*b*) of this group is the complete degeneration of the growing point, which presents a flattened appearance, as though cut with a knife, instead of producing a normal bud. Diseased plants (*c*) frequently put out numerous axillary buds from the current season's wood at the beginning of June. The leaves (*d*) are dark green to leaden-grey, hard and leathery, like the pinnate leaves of leaf roll-diseased potatoes. The leaves and petioles (*e*) assume an erect growth habit.

Group (1) may be further subdivided into two types, in one of which (*a*) the stiff growth habit is the most prominent symptom, while (*b*) is characterized in the first place by drastic truncation of the long shoots, dying-off of the terminal bud, and a profusion of axillary buds on the current season's wood. The leaves of plants in which type (*a*) predominates display the most bizarre shapes and the fine, regular dentation of normal foliage is usually lacking, the margin usually being deeply lobate, occasionally smooth or nearly so, while the size of the lamina is generally

much reduced. The colour of the leaves is usually darker than in healthy plants, with a diffuse mosaic, narrow, pale green stripes frequently running alongside the veins, the abnormal paucity of which imparts an abnormal smoothness to some areas of the blade alternating with irregular protuberances. A particularly characteristic feature of the diseased leaves is the absence of the normal tridimensional conformation, which gives them the flattened aspect of pressed specimens, while a further anomaly consists in the quasi-geometrical arrangement on the shoot of the stiffly upward-tending leaves and petioles, in marked contrast to the normal foliage.

In type (*b*) the most striking symptoms are the dark green to leaden grey hue and exceptionally large size of the leaves of the truncated shoots. On the other hand, the foliage of the shoots arising from the above-mentioned axillary buds put out in June are of a sharply contrasting pale green, with a diffuse mottling, and mostly very much malformed.

Group (2) is composed of plants affected by a rare and much less harmful disorder characterized by clearing of the veins and sometimes of the surrounding tissues.

The economic importance of the disease complex should not be underrated, the stiff growth habit and giant foliage of group (1*b*) being specially deleterious. In some of the nurseries inspected, 20 to 40 per cent. of the bushes showed such acute symptoms that only a very poor harvest or none could be expected. Edaphic and other environmental factors being excluded as causes of the pathological syndrome, the source must reside within the plant, probably in the form of a virus.

White (N. H.). **Septoria leaf spot of Currants.**—*Tasm. J. Agric.*, xvi, 4, pp. 153–163, 8 figs., 1945.

A popular account is given of *Mycosphaerella ribis*, causing a leaf spot, especially of black currants, in Tasmania, where it is destructive in certain seasons. Control suggestions include the destruction of all fallen leaves, where possible, as these bear perithecia, and spraying with Bordeaux mixture at 3-3-100 when the fruit is half-grown and again at the same or double strength after picking. The 6-6-100 concentration after picking may cause premature defoliation, though without serious results.

Martyn (E. B.). **A note on Banana leaf speckle in Jamaica and some associated fungi.**—*Mycol. Pap., Imp. mycol. Inst.*, 13, 5 pp., 3 figs., 1945.

The author describes banana leaf speckle (*Chloridium musae*) [*R.A.M.*, xvi, p. 476] as it occurs in Jamaica. The 'rhizomorphs' referred to by Stahel were produced in culture and the size of the spores still attached to the conidiophores, or recently shed, agreed with Stahel's measurements (5 to 8 by $2\frac{1}{2}$ to $3\frac{1}{2}$ μ), but after shedding they increased to 11 to 16 by 3 to 5 μ, reaching in old cultures occasionally up to 21 μ in length, and many became uniseptate. Successful inoculations were carried out both in the field and in the laboratory.

Speckling by *C. musae*, when macroscopically observable, is black or dark brown, and a regularly distributed, pale brownish flecking, caused by another weakly parasitic fungus, may be seen on mature banana leaves in humid areas if the yellowing parts of the leaf are examined closely. Conidiophores, longer and stouter than those of *C. musae*, up to six-fasciculate, bi-to quinque-septate, 60 to 500 by 3·5 to 6 μ, bear on terminal branches catenulate spores, 6 to 22 by 2·5 to 4 μ in diameter, somewhat similar in shape and size to those of *C. musae*. The surface mycelium is not so profuse, distinctive, or widespread as that of *C. musae*, and enters the stomatal apertures less frequently, though some stomatopodia are found. This fungus is described by E. W. Mason as *Cladosporium musae* n.sp., differing as it does from every species of the genus seen in culture in (1) the differentiation between repent mycelium and the conidiophore, (2) the persistent branches at the apex of the conidiophore, and (3) the conidial chains formed on

both differentiated conidiophores and on the undifferentiated mycelium. *Ramichloridium musae* Stahel [loc. cit.] was described as forming conidia singly as in *Chloridium musae*, and is accordingly regarded as distinct.

In the course of examination of banana leaves a peculiar fungus was found constantly growing epiphytically upon the under surfaces, especially near the margins; it is assigned by Mason to a new genus *Zygophiala* and named *Z. jamaicensis* n.sp.

Indagini tossicometriche sugli anticrittogamici. I–X. [Toxicometric researches on fungicides. I–X.]—*Atti Ist. bot. Univ. Pavia*, Ser. 5, i (2), pp. 87–213, 9 figs., 2 graphs, 1943. [Received February, 1946.]

In the introduction (pp. 87–93) to this series of papers based on work begun in 1941 at Florence and continued at the Centre of Fungicidal Studies, Pavia, R. Ciferri discusses in detail the nature of the difficulties involved in the problem and concludes that there are two aspects to toxicometric determinations. One is testing *in vitro* under entirely artificial conditions, which are, however, easy to reproduce and always identical. These conditions give a conventional but uniform basis to the work. This method of testing is always comparative, since it constantly refers to a fungicide-type which serves as 'model' to that being tested. The second method consists of *in vivo* tests under conditions approximating to the natural ones optimum for the development of the disease. Here uniformity is less, but the basis is not conventional. This is an absolute method of evaluation, since it is independent of reference to any fungicide-type.

In the second paper (pp. 94–105), the same writer, reviewing some of the most outstanding work done on the testing of fungicides from the end of the last century up to 1943, expresses the view that the complete study of a fungicide involves: (1) the determination of fungicidal ability *in vitro* in the laboratory in conditions most favourable to the activity of the material; (2) as (1) but under less favourable conditions (generally different, successive dilutions), to determine the limits of efficacy of the material; (3) determination of fungicidal ability *in vivo*, either in the glasshouse or in the open, before the material has been exposed to meteorological conditions; (4) as (3), but after the material has been so exposed and (5) determination of the susceptibility of the fungus to the active principle of the preparation, so as to distinguish between the effect upon it of this principle and the effect of other substances present, the manner of preparation, and the like.

In the third paper (pp. 106–119), R. Ciferri and E. Baldacci, after a detailed discussion of the factors adversely affecting the uniformity of conditions under which laboratory tests of the toxicity of fungicides are carried out, describe an apparatus in which glass slides on a slowly rotating disk driven by an electric motor and covered by a zinc container with an aperture are exposed one at a time to a fine spray of fungicide, which is allowed to fall on them from above by force of gravity. It is claimed that this facilitates correct timing of exposure to the spray (as it is only necessary to count the number of turns of the disk) and also renders the atomization more uniform.

In the fourth paper, R. Ciferri and G. Barbensi give a detailed account of an investigation in which the method of analysis of variance was applied, in studies on the toxicity of fungicides, to a number of factors likely to affect the uniformity of the results obtained in parallel tests, i.e., differences in germination as between one slide and another sprayed at the same time, and between different drops on the same slide, personal errors of the worker, including the fatigue factor, imperfect control of the pressure and duration of atomization, nozzle diameter, and the particular species of fungus used. Recommendations based on the data obtained are made for minimizing these sources of error.

The fifth contribution, by R. Ciferri (pp. 155–156), describes a kind of tally

register by means of which the numbers of germinated and ungerminated spores observed *in vitro* can be recorded with one hand while the observations are being made, the totals of the counts being always visible.

In the sixth paper (pp. 157–159), R. Ciferri states that as a means of checking the atomization by hand of glass slides in *in vitro* tests of copper fungicides, he places the slides to be sprayed on paper treated with a solution of 2 gm. pure potassium ferrocyanide with 2 c.c. pure concentrated nitric acid in 100 c.c. water [cf. Blodgett and Mader: *R.A.M.*, xiii, p. 587]. The slides are sprayed in the ordinary way and drops falling on to the treated paper leave a brown stain. In this way, it is easy to judge by eye of the regularity and intensity of the spray.

In the seventh paper (pp. 160-167), R. Ciferri, G. Gallina, and E. Baldacci express the view that in evaluating the toxicity of a fungicide it is essential to take into consideration in every test the percentage of non-germination in water and that in some standard fungicide, such as Bordeaux mixture. To say that a given fungicide results in '60 per cent. non-germination' is of doubtful value, if there is only 10 per cent. non-germination in water and 95 per cent. in Bordeaux mixture. To arrive at a reliable figure, subtraction should be made from every 100 spores of the 15 whose behaviour is independent of the fungicide being tested (i.e., the 10 that do not germinate in water and the 5 that germinate in Bordeaux mixture). There remain 85 spores, of which, say, 30 do not germinate in the given fungicide. Toxicity is therefore equivalent to the killing of $\frac{30}{85}$ of the spores, or 35·29 per cent. Generalizing this, if $\frac{m}{100}$, $\frac{a}{100}$, and $\frac{n}{100}$ are the percentages of non-germinated spores in water, the tested fungicide, and Bordeaux mixture, respectively, then the percentage non-germination actually due to the fungicide is given by the formula $x = 100\frac{a-m}{n-m}$. If $m = 10$ and $n = 95$, the following figures are obtained: actual percentages of non-germination, 10, 20, 30, . . . 95, and corresponding adjusted percentages, 0, 11·76, 25·53, . . . 100.

The paper concludes with notes on tests of the average germinability of the conidia of an *Alternaria* of the *A. tenuis* type in water, Bordeaux mixture, and Caffaro powder.

In the eighth paper (pp. 168–177), R. Ciferri, G. Barbensi, and E. Baldacci, using the formula $\chi^2 = \frac{N(ad-bc)^2}{(a+b)(c+d)(b+d)(a+c)}$, compile a table of indices from which the toxicity of any fungicide can be immediately found after observation of the number of spores that germinate when 100 spores have been treated by it, relatively to germination in water (toxicity nil) and in Bordeaux mixture (maximum toxicity). It is assumed that germination (g) in water is 90 spores and non-germination (ng) 10, while in Bordeaux mixture g is 5 and ng 95, 100 spores being used each time. The index is arrived at by using $\chi_1^2 - \chi_2^2$, which gives a figure ranging from −144·86 to +144·86. This, at the maximum, gives a new index ranging from −1 to +1, which can be regarded as a good criterion of toxicity. The index increases as χ_1^2 becomes greater, that is as toxicity becomes more marked, and intermediate values can be found by interpolation. This gives a table in which when g is 90, 85, 80, . . . 50, . . . 5, and ng 10, 15, 20, . . . 50, ... 95, χ_1^2 is 0·00, 1·14, 3·63, . . . 38·10, . . . 144·86, χ_2^2 is 144·86, 129·29, 115·08, . . . 51·26, 0·00, and $(\chi_1^2 - \chi_2^2)$ 144·86 is −1·00, −0·88, −0·77, . . . −0·09, . . . 1·00.

The value −1 corresponds to a germination or non-germination equal to that in water, i.e., toxicity nil; the value +1 corresponds to a germination or non-germination equal to that in Bordeaux mixture, i.e., maximum toxicity; and the value 0 corresponds to a toxicity of half the maximum.

In the ninth contribution (pp. 178–202), R. Ciferri and L. Cavalli discuss from the mathematical point of view the evaluation of the toxicity of fungicides by the method of the 'straight line of action' of Prigge and Schaefer, with special reference to the interpretation of the curve of action and the method of rectification, the use of graphic methods, random sampling, general rules for the application of the straight line of action, the case of non-rectifiable curves, and their theoretical significance and elaboration in practice.

In the tenth contribution (pp. 203–212), R. Ciferri discusses methods used by himself and other workers for testing the 'collateral characteristics' of fungicides, i.e., the qualities other than fungistatic and fungicidal that they possess, including adhesiveness and residual fungicidal ability (fungicidal and fungistatic power remaining after exposure to meteorological conditions), behaviour in suspension, and wettability.

Indagini tossicometriche sugli anticrittogamici. XI–XXII. [Toxicometric researches on fungicides. XI–XXII.] *Atti Ist. bot. Univ. Pavia*, Ser. 5, v (1), pp. 3–187, 1 pl., 2 figs., 3 diags., 18 graphs, 1944. [Received February, 1946.]

In the eleventh paper of this series (pp. 3–18) and the first in the present volume [see preceding abstract], R. Ciferri and E. Baldacci give a full account of *in vitro* tests of the relative toxicity of various metallic salts to an *Alternaria* of the *A. tenuis* group and to *Plasmopara viticola*. The results obtained indicated that copper, silver, and mercury were of very high, cadmium of high or medium, and zinc of very slight, toxicity.

In the twelfth paper (pp. 19–30), L. Cavalli and R. Ciferri deal with the mathematical evaluation of the toxicity of fungicides, with reference to analysis of the distributions of frequency of the percentages of non-germination, based on observations on about 290,000 conidia of *A. tenuis* group. The work done, which is not yet fully completed, is discussed in detail.

In the thirteenth paper (pp. 31–37), R. Ciferri describes a mathematical method of checking the accuracy of laboratory tests of the toxicity of fungicides. He concludes that (1) in testing *in vitro* the fungicidal power of a given preparation on *A. tenuis* group, conidia of normally developed colonies may be used up to the age of one month, after which the exactitude of the results begins to decline; (2) cultures grown at a temperature much above the optimum, i.e., at 30° C. instead of 20° to 21°, are less reliable than those grown at the optimum; (3) the inexactitude of the test becomes appreciable if the cultures are contaminated by extraneous organisms; (4) a density of conidial suspension in the hanging-drop culture double that normally used reduces the exactitude of the test, while a density four times the normal still further reduces it; (5) the optimum temperature for the germination of the conidia is between 20° and 26°; (6) the optimum time for counting the germination is after 24 hours; after 12 or 48 hours the results are less accurate, after 72 still less, and after six hours still less again.

In the fourteenth paper (pp. 38–58), R. Ciferri and E. Baldacci give a detailed account of tests of the fungicidal effect of citric acid and tartaric acid in copper mixtures carried out in hanging-drop cultures on conidia of *A. tenuis* group. The immediate fungicidal ability of citric acid and tartaric acid was very small in the concentrations of 'ramital' [Casale's mixture: *R.A.M.*, xxii, pp. 52, 287] used, and it is probably small in other materials. The most salient effect shown was a marked acceleration of the absorption of copper by the fungus in very dilute solutions, particularly after 20 to 45 minutes' contact. In copper sulphate, the fungus suddenly began to absorb appreciable quantities of copper between the 45th and 60th minute, whereas in the presence of citric acid and tartaric acid, absorption was more uniform and began between the 10th and 25th minute. At the 45th

minute, in these conditions, the cell was experiencing fully the fungistatic and partly fungicidal effect of the copper ions.

In the fifteenth paper (pp. 59–80), R. Ciferri and E. Baldacci present evidence showing that a zinc salt exerts an effective anti-germinative potentializing power when added to a copper salt of equal anion, but only in solutions of the salts themselves and at the critical threshold of toxicity.

In the sixteenth paper (pp. 81–92), E. Baldacci and R. Ciferri describe experiments the results of which indicated that oxyquinolin derivatives exert a potentializing effect on the fungicidal efficiency of certain copper and zinc salts.

In the seventeenth paper (pp. 93–111), R. Ciferri and E. Baldacci, describing laboratory experiments on the use of lime as a fungicide, conclude that milk of lime is not likely to prove of practical value in the control of *Plasmopara viticola*.

In the eighteenth paper (pp. 112–129), R. Ciferri describes a method of determining the behaviour of fungicides in suspension by measuring the velocity of sedimentation by means of a photo-electric cell.

In the nineteenth paper (pp. 130–144), E. Baldacci and R. Ciferri give full details of a method of determining the immediate preventive effect of a fungicide on vines artificially infected with *P. viticola* in the greenhouse, i.e., immediately the material has been sprayed on to the leaves and before it becomes affected by meteorological factors.

In the final papers (pp. 145–186), V. Gallo and E. Baldacci deal with the quantitative evaluation of the toxicity of fungicides tested under *in vivo* conditions, E. Baldacci treats of the biology of *P. viticola* in glasshouse inoculations, and L. Cavalli describes a method of interpolation of curves of action of plant protectives.

Mulder (D.). **Biologisch onderzoek van grondontsmettingsmiddelen.** [Biological investigation of soil disinfectants.]—Thesis, Univ. Amsterdam, 114 pp., 12 figs., 3 graphs, 1943. [English and German summaries. Received November, 1945.]

Following a review of the literature on soil disinfection by chemical methods, in connexion with which the paucity of systematic laboratory studies in this immense field is emphasized, the author fully describes and tabulates his experiments with a number of inorganic and organic compounds against *Pythium debaryanum*, *Rhizoctonia solani graminis*, *Fusarium culmorum*, and *Trichoderma lignorum* [*T. viride*]. The *dosis toxica* in relation to the fungi and the *dosis tolerata* for seedlings were determined in order to compute the chemotherapeutical index, the growth of *P. debaryanum* in a plain 0·5 per cent. saccharose solution serving as a criterion of toxicity, while garden cress (*Lepidium*) [*sativum*] and other seedlings grown on nutrient solutions supplied material for the estimation of the effects of the fungicides on the hosts. In adsorption tests the mycelial growth of *P. debaryanum* afforded a much more accurate means of ascertaining the concentration than chemical methods. A low and therefore favourable index figure in the laboratory, however, does not necessarily coincide with adequate disinfectant properties in the ground; the latter are influenced by different factors from those operating in *in vitro* trials, notably the adsorption of the compound in the soil, whereby its efficiency decreases. In tests in garden soil and adsorbent coal the phenyl mercury compounds were adsorbed ten times as strongly as those of ethyl mercury.

Optimum conditions for damping-off were provided by a closed experimental chamber with natural lighting maintained at a temperature of 25° to 30° C. In greenhouse tests with spinach at 20° to 25° soil humidity was shown to exert a decisive influence.

Absolute disinfection was secured only by treatment with 4 per cent. formalin solution, but a dust consisting of a mixture of formalin and infusorial earth or

sawdust gave almost equally good results. The mercury compounds were also shown to be applicable in the dry state. Promising results were further obtained with cuprous and zinc oxide dusts as soil and seed disinfectants for the control of pre- and post-emergence damping-off.

TILEMANS (E.) & MARTENS (P. H.). **Contribution à l'analyse des produits phytopharmaceutiques. I. Considérations sur l'analyse en phytopharmacie.** [A contribution to the analysis of plant-protective products. I. Considerations on analysis in plant protection.] —*Parasitica*, i, 3, pp. 102–105, 1945.

After referring to the greatly increased numbers of plant-protective products that have come into use in the last ten years, the authors point out that analysis of some of these materials raises complex problems; their physical properties are sometimes as important as the amount of active substance present, and have to be determined by physico-chemical methods. Furthermore, analysis of a plant-protective product also involves biological tests. At the official research station, Gembloux, Belgium, the plant-protection section has been commissioned to examine and test every anti-parasitic product made or sold in Belgium, and all known methods of test are being applied to this end.

YARWOOD (C. E.). **Copper sulphate as an eradicant spray for powdery mildews.**—*Phytopathology*, xxxv, 11, pp. 895–909, 9 graphs, 1945.

The experimental demonstration that the eradicant value of Bordeaux mixture for the control of bean [*Phaseolus vulgaris*] powdery mildew (*Erysiphe polygoni*) decreased with rising proportions of lime in the spray [*R.A.M.*, xxiii, p. 182] prompted this further study on copper sulphate as a fungicide for the disease in question and others of the same group.

The addition of a spreader, glyceryl alkyl resin (B 1956, Rohm & Haas Co.), to water sprays decreased the deposit on the under sides of cantaloupe and bean leaves from 2·6 to 1·25 and from 1·5 to 0·5 gm. per sq. dcm., respectively, but increased the coverage.

The extent of injury from blue stone [copper sulphate] spray was measured on foliage of field- or greenhouse-grown plants of bean, cucumber, cantaloupe, beet, grape, pea, hops, mustard, potato, tomato, rose, and apple. The concentration of copper sulphate required to cause 50 per cent. damage ranged from 0·035 per cent. for mustard to over 10 per cent. for beet. The addition of a spreader usually mitigated the injury from copper sulphate, but in the case of greenhouse beans it increased the damage from Bordeaux. To produce a 50 per cent. injury to bean about ten times as much copper was necessary in the form of Bordeaux as in that of copper sulphate.

The eradication of bean powdery mildew was effected at minimum copper dosages with copper sulphate plus spreader. Thus, for 95 per cent. eradication a spray containing about 0·04 per cent. copper sulphate plus spreader was requisite, while to achieve a comparable effect about 2·4 times as much copper was needed in the form of copper sulphate without spreader and 6·4 and 18 times as much, respectively, in that of Bordeaux with and without spreader. On the basis of maximum control and minimum injury, 0·06 per cent. copper sulphate plus spreader was the most effective treatment, followed in descending order by 0·4 per cent. Bordeaux plus spreader, 0·8 per cent. of the same without spreader, and 0·08 per cent. copper sulphate without spreader. The other soluble coppers, copper chloride, copper nitrate, and copper acetate, appeared to be about equal to copper sulphate as eradicant sprays, but those of the insoluble class, including (besides Bordeaux) Burgundy mixture, cuprous oxide, basic copper sulphate, copper oxychloride, and copper carbonate, were decidedly less effective. Copper sulphate plus spreader also proved superior to several other non-sulphur and non-copper chemicals tested.

Conidia of *E. polygoni* from bean and mustard germinated well (17 and 28 per cent., respectively), on the surface of 10 per cent. copper sulphate solutions, suggesting that *in vitro* tests of the effect of chemicals on spore germination are of little value in the appraisal of their practical fungicidal properties.

The spray concentration requisite for 95 per cent. eradication of bean and cucumber powdery mildews decreased from a maximum of 0·3 per cent. copper sulphate applied at the time of inoculation to 0·03 per cent. a week later. Lower concentrations were necessary to control the disease on beans during the daytime than at night.

Heavier dosages of most sprays were required for protection than for eradication, about 100 times as much copper sulphate, for instance, being necessary for 95 per cent. control in a protective as in an eradicant application.

The green weight of foliage and the fruit yield on bean, cucumber, and cantaloupe plants on which powdery mildew was combated with eradicant treatments of copper sulphate plus spreader in greenhouse and field trials exceeded that obtained from comparable unsprayed plants.

Pettey (F. W.). **Biological control of Prickly Pear.**—*Fmg S. Afr.*, xxi, 238, pp. 31–33, 1946.

In this further account of the biological control of prickly pear (*Opuntia* sp.) [cf. *R.A.M.*, xxi, p. 33] in South Africa the author states that one of the insects used in the campaign, the cochineal insect (*Dactylopius opuntiae*), has recently been attacked in coastal and non-Karoo areas by a species of *Empusa* [cf. ibid., xxiv, p. 402].

Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, lvi, 12, pp. 537–540, 2 figs., 1945.

Brief, practical directions are given for seed treatments against fungal diseases of plants by means of hot water, liquid chemicals, and dusts, with instructions for making a simple apparatus for hot-water treatments.

Klemm (M.). **Ernteverluste, Schadensschätzung und Pflanzenschutzstatistik.** [Crop losses, estimation of damage, and plant protection statistics.]—*Forschungsdienst*, x, 3–4, pp. 265–275, 1940. [Received January, 1946.]

This paper contains many interesting observations on the statistical aspect of plant protection, among which the following may be mentioned. It is essential to distinguish between the indirect and the direct effects of crop losses, the former including, for instance, a fall in the purchasing power of the agricultural population and the increased expenditure incurred through the need for replacement of the missing produce from extraneous sources, while the latter relate solely to the harvest reductions from a given pathogenic agency. Actual losses (representing the unredeemed values of the decimated crop, costs of control measures, outlay for replanting, and the like) must also be differentiated from potential losses, while yet another line must be drawn between avoidable losses and those against which control measures are at present impracticable for economic or technical reasons.

Crop loss statistics may serve different purposes. For instance, if the importance of cultivated crop pests in the national economy is to be considered, the sum-total of the actual (direct and indirect, avoidable and unavoidable) harvest reductions must be computed. For an estimate of the economic significance of plant protection, data relative to the potential damage, in the absence of control measures, should form the criterion. A decision as to the outlay of money and labour in the execution of plant-protective operations should be based exclusively on actual avoidable and direct losses, whereas unavoidable reductions are also of interest in propaganda for the study of plant protection. In most of the published statistics on crop losses it is hardly possible to determine which of the differential categories is involved; hence no doubt the immense discrepancies in the estimates.

The statistical method of appraisal of crop losses from disease is based on the study of as large a number as possible of reports of the plant protection intelligence service from different parts of the country. The analytical method, involving the determination of the distribution, incidence, and persistence of the parasites and of the regions subject to repeated intensive attacks, and a study of the interrelationships of the pathogens, affected areas, and environmental factors (economic, climatic, biological, and edaphic), demands specially trained assistants and is applicable only in special cases and within narrow limits. The principal sources of error in the computation of crop damage lie in the wide local and seasonal variations in growth conditions; the varying reactions of plants to a given pathogen according to their stage of development, age, species, or variety; nature and number of pathogens, time of occurrence, environmental requirements, and the like. Exaggeration of the damage caused by parasitic agencies is a more common fault than under-estimation of their importance.

The most important plant parasites may be grouped in the following categories: (*a*) precluding the cultivation of a particular crop in a given locality without constant control measures, e.g., potato wart [*Synchytrium endobioticum*], elm die-back [*Ceratostomella ulmi*]; (*b*) sporadically destructive of certain crops, such as potato late blight [*Phytophthora infestans*] (epidemic in Germany in 1916), cereal black rust [*Puccinia graminis*] (Silesia, 1932), and Douglas fir [*Pseudotsuga taxifolia*] blight [*Phaeocryptopus gaeumanni*]; (*c*) occasionally responsible for heavy losses in certain districts, e.g., potato scab (*Actinomyces scabies*); (*d*) generally of moderate intensity, but at times severe or widespread in a mild form such as cereal yellow rust [*Puccinia glumarum*] and smuts [*Ustilago* spp.]; and (*e*) mostly unimportant, like cereal foot rots [*Fusarium* spp., *Ophiobolus graminis*, and *Leptosphaeria herpotrichoides*] and ergot [*Claviceps purpurea*].

Bush (M. T.), Goth (A.), & Dickison (H. L.). **Flavicin II : an antibacterial substance produced by an Aspergillus flavus.**—*J. Pharmacol.*, lxxxiv, 3, pp. 262–277, 1 fig., 1945.

The present report deals mainly with progress in the production and purification of flavicin, originally described (*J. Pharmacol.*, lxxviii, pp. 164–169, 1943) as an impure, penicillin-like, relatively non-toxic, anti-bacterial substance elaborated by a strain of *Aspergillus flavus*. The chemical and antibiotic properties of flavicin are stated to be very similar to those of penicillin.

Furtado (A. Da R.). **Pesquisa da atividade antibacteriana com 180 amostras de Aspergillus Micheli, 1729.** [Investigation on the anti-bacterial activity of 180 strains of *Aspergillus* Micheli, 1729.]—*Mem. Inst. Osw. Cruz*, xli, 2, pp. 205–222, 1944. [English summary. Received February, 1946.]

Of 180 strains of *Aspergillus* investigated at the Oswaldo Cruz Institute, Rio de Janeiro, for their anti-bacterial activity, 25 totally inhibited the growth of the test organism, *Staphylococcus aureus*, 32 caused partial suppression, and 123 were quite inactive [cf. *R.A.M.*, xxii, p. 13]. Among the species giving positive results were *A. sydowi*, *A. oryzae*, *A. repens*, and *A. parasiticus*, but in a number of cases discrepancies occurred in the results obtained with different strains of the same species, or at the two assays, one after six and the other after twelve days of growth.

Velu (H.), Comandon (J.), De Fonbrune (P.), & Janot (M. M.). **Pléomorphisme du Penicillium notatum et potentialité antibiotique.** [Pleomorphism of *Penicillium notatum* and antibiotic potentiality.]—*C. R. Acad. Sci., Paris*, ccxxii, 7, pp. 406–408, 1946.

Two strains of *Penicillium notatum*, namely, 4222 from the Lister Institute and 1249 from the Northern Regional Research Laboratories (United States) [*R.A.M.*,

xxv, pp. 129, 130], showed a strong tendency to pleomorphism, reversible only with great difficulty, which impaired or entirely suppressed their bacteriostatic activity.

Sardiña (J. R.). **Enfermedades de la Patata.** [Potato diseases.]—*Publ. Estac. Fitopat. Agríc. Coruña* 5, viii+111 pp., 11 pl. (3 col.), 37 figs., 1945.

This useful compilation comprises summaries of the essential information concerning the terminology, geographical distribution, symptomatology, etiology, morphology, pathological anatomy, environmental relations, and control of the following diseases affecting the potato crop in Spain: black leg (*Bacillus phytophthorus*) [*Erwinia phytophthora*], bacterial wet rot of the tubers (*E. phytophthora* and other organisms), actinomycosis or common scab (*Actinomyces scabies*), late blight (*Phytophthora infestans*), *Rhizoctonia* [*Corticium*] *solani*, early blight (*Alternaria solani*), dry rot (*Fusarium caeruleum*, *F. solani*, and *F. trichothecioides*), leaf roll, virus X, virus Y, virus A, and virus F [potato aucuba mosaic virus], internal rust spot, darkening of tubers on cooking in consequence of rough handling in packing or transport [*R.A.M.*, vi, p. 632; xxiii, pp. 40, 76, *et passim*], black heart, hollow heart, and other disturbances of physiological origin. A number of diseases not hitherto reported from Spain, and two doubtful records (*Bacterium* [*Corynebacterium*] *sepedonicum* and *Pseudomonas* [*Xanthomonas*] *solanacearum*), are also included. The concluding chapter deals with control measures in general, and a key for the identification of the principal diseases by their symptoms on the tubers, foliage, and stems is appended.

The functions of the National Service of Seed Potato Production, established by a Decree of 6th December, 1941, are regulated by an Order of the Ministry of Agriculture of 16th May, 1942. The stock falls into two classes, one designated as 'authorized for seed', and the other 'selected for seed'. The latter alone confers an official guarantee of freedom from disease, and is accompanied by a State certificate. An account is given of the methods adopted for the development of élite planting material.

Del Cañizo (J.) & Sardiña (J. R.). **Enfermedades y alteraciones de las Patatas.** [Diseases and abnormalities of Potatoes.]—39 pp., 20 col. pl., Estación Central de Fitopatología Agrícola, Madrid, 1944. [Received March, 1946.]

This booklet presents an outline of the available information concerning some well-known diseases of parasitic and physiological origin and insect pests affecting the potato crop in Spain.

Quanjer (H. M.). **Rhizoctonia-ziekte in Aardappelen en bemesting.** [*Rhizoctonia* disease in Potatoes and manuring.]—*Tijdschr. PlZiekt.*, xlvi, 5, pp. 175–176, 1940. [Received February, 1946.]

There are conflicting reports in the relevant literature concerning the effects of stable manure on the incidence of *Rhizoctonia* [*Corticium*] *solani* in potatoes [*R.A.M.*, iv, p. 632; viii, p. 664; xviii, p. 612], which the author attributes to the varying degrees of freshness of the material applied. Probably the decisive factor is the large-scale production in fresh manure of carbon dioxide, which acts adversely on the potato shoots but not on the fungus. Observations along these lines were made by Lundgårdh in connexion with cereal fusarioses [ibid., ii, p. 382], and it is suggested that the potato *Rhizoctonia* problem might be similarly approached with fruitful results.

Hutton (E. M.) & Bald (J. G.). **The relationship between necrosis and resistance to virus Y in the potato. 1. Greenhouse results.**—*J. Coun. Sci. industr. Res. Aust.*, xviii, 1, pp. 48–52, 3 pl. (following p. 84), 1945.

In breeding work on resistance of potatoes to virus Y carried out at Canberra, two crosses, Snowflake × Katahdin and Brown's River × Katahdin, were made in

1941, while at the same time the Katahdin variety was selfed. Small tubers from the resulting seedlings were planted in the greenhouse, and inoculated in November, 1942. Seedling reactions to inoculation were promising, and among the group of hybrids finally retained for study were three types of necrotic action (unaccompanied by mottling) which appeared promising as a basis for resistance to virus Y. Hybrid 48 after inoculation became severely necrotic, and developed a severe leaf-drop streak resulting in total collapse in a month. Hybrid 106 rapidly developed top necrosis, resulting in collapse of the growing point. With both, reaction on the inoculated leaves after 10 days was severe, resulting in severe necrosis, yellowing, and leaf drop. With hybrid 404, relatively small, localized, necrotic lesions developed rapidly on the inoculated leaf, sometimes, but not always, followed by leaf drop. That these three types of necrotic reaction constitute a protective barrier against virus Y under greenhouse conditions was demonstrated by the fact that tubers from infected plants produced either healthy plants or small, severely necrosed plants which died soon after they emerged. Also, these hypersensitive hybrids, when grafted with an Epicure scion containing virus Y, reacted with severe top necrosis in 14 days.

During the winter in the greenhouse many hybrids gave reactions to Y confined to the inoculated leaves. Tubers from the inoculated plants gave plants free from Y. That false results can be obtained under winter conditions was demonstrated when these hybrids were tested again in early summer, when many had to be discarded because of unsatisfactory reactions. Atypical results also occur when very young or weakly growing plants are used for testing, the reaction with these always being more severe, sometimes with suppression of the mottle.

Selfing or intercrossing the hypersensitive hybrids results in at least one-third of the seedling progeny showing promising reactions to Y. Crossing hypersensitive hybrids with potato varieties possessing the typical rugose mosaic reaction to Y gives approximately 5 per cent. seedling progeny with valuable necrotic reactions to the virus.

Hutton (E. M.). **The relationship between necrosis and resistance to virus Y in the Potato. 2. Some genetical aspects.**—*J. Coun. sci. industr. Res. Aust.*, xviii, 3, pp. 219–224, 1945.

After stating that earlier work by Hutton and Bald having demonstrated that it is possible by hybridization to increase the intensity and speed of the necrotic reactions to virus Y found in some potato varieties [see preceding abstract], building up a sensitive reaction like that of the Epicure variety to viruses X and A, the author describes 15 Y-hypersensitive phenotypes. These, and those obtained from selected crosses and selfings fall into three classes, the local necrotic, top necrotic, and the necrotic collapse, of which the first two are perhaps the most valuable.

Of the potato varieties grown in Australia, Snowflake Katahdin, and Brown's River appear to show more promise as a source of Y-hypersensitivity than Bismarck, Delaware, Factor, and Sebago.

When hypersensitive types have been selected from hybrid progeny, crosses involving them can produce 10 to 30 per cent. hypersensitive seedlings.

Inheritance of Y-hypersensitivity appears to be due to a recessive allele or alleles, tolerance of the virus being the dominant condition.

Bald (J. G.) & Oldaker (C. E. W.). **Reactions of Tasmanian Bismarck and Brownell potatoes to the commoner virus diseases.**—*J. Coun. sci. industr. Res. Aust.*, xviii, 3, pp. 209–218, 3 pl. (facing p. 276), 1945.

A description, intended to assist inspectors and field workers, is given of the symptoms of viruses X, A, and Y, and of leaf roll on Bismarck and Brownell potatoes, which are exported from Tasmania to New South Wales [cf. *R.A.M.*, xxiv, pp. 92, 403].

On Bismarck virus X produces symptoms noticeable only after very careful examination, A causes formation of light-coloured areas with nebulous boundaries centred on the veins, with sometimes slight distortion of the leaf. Virus Y is less important on Bismarck than X and A, but when it does develop the symptoms are more serious than those of crinkle due to X plus A, though it attacks much fewer plants. Bismarck is very resistant to leaf roll, but when the plants are attacked they become severely dwarfed and bushy.

All Brownell plants carry X, but are field-immune from A; reactions to Y take the form of leaf-drop streak and rugose mosaic, the disease being composite (X+Y). Brownell is, except for Up-to-Date, the most susceptible to leaf roll of the commonly grown Australian varieties, and the virus is the main cause of degeneration in this variety.

The paper concludes with a section on the diagnosis of virus infection in these two potato varieties.

Sukhorukov (K.) & Kling (E.). **Influence of copper upon the Potato plant.**—*C. R. Acad. Sci. U.R.S.S.*, N.S., xlvii, 6, pp. 436–438, 1945.

Leaves from potato plants treated with copper and inoculated with a highly virulent suspension of the conidia of *Phytophthora infestans* showed after four days a poor growth of mycelium of the fungus, with slight formation of conidia and sharply delimited, dark necroses to the extent of 30 per cent. of the leaf, whereas the controls showed 100 per cent. darkening of the whole leaf, with good growth of mycelium and normal conidial formation. Further experiments showed that, while the growth of *P. infestans* was stimulated in culture by the presence of 0·125 per cent. copper and depressed by stronger solutions, peroxidase activity [*R.A.M.*, xix, p. 300] was greater in the copper-treated leaves than in the controls (in the proportion of 18·1 to 12·2). Potato species and varieties immune from *P. infestans* showed a higher peroxidase activity than susceptibles, and the authors believe that copper does not only protect the plant directly by its toxic action but indirectly through a change induced in the physiological properties of the plant.

Black (W.). **Inheritance of resistance to blight (Phytophthora infestans) in Potatoes: unbalanced segregations.**—*Proc. roy. Soc. Edinb.*, Ser. B, xlii, Part II (No. 20), pp. 171–181, 2 figs., 1945.

In continuation of his studies of the inheritance of resistance to two strains, A and B, of *Phytophthora infestans* in derivatives of the triple hybrid (*S*[*olanum*] *rybinii*×*S. demissum*)×*S. tuberosum* and in hybrids descended from *S. demissum*×*S. tuberosum* [*R.A.M.*, xxv, p. 73], the author examined a number of progenies bred from selections in the first back-cross generation of the triple hybrids for their reaction to the A strain. Additional data on blight inheritance were secured from multiple hybrid material originating from the work of the late Dr. Wilson of St. Andrews.

The evidence obtained indicates that resistance is controlled by major and minor genes. On the former depends the major reaction, i.e., resistance or susceptibility; the latter determine the degree of susceptibility in susceptible varieties or act as unidentifiable modifiers in resistant varieties.

Segregation of resistant and susceptible plants in the progenies showed a consistent excess of recessive individuals compared with the standard ratios 1 : 1, 3 : 1, and 15 : 1.

The excess of recessives may be due partly to chromosome homologies leading to multivalent formation and double reduction. In the material used, the excess was largely due to the differential compatibility of gametes arising from residual incompatibility factors associated with the original 'wild' material.

Sleeth (B.). **Agar medium and technique for isolating Pythium free of bacteria.**—*Phytopathology*, xxxv, 12, pp. 1030–1031, 1945.

The usual laboratory methods having proved ineffectual for the isolation of *Pythium* [*ultimum*] in a pure state from guayule [*Parthenium argentatum*] seedlings in California [*R.A.M.*, xxv, p. 43], the following technique was substituted with highly satisfactory results. A medium consisting of 10 gm. dextrose, 2 gm. ammonium acid phosphate, 1 gm. each potassium nitrate and magnesium sulphate, 25 gm. agar, and 1,000 c.c. distilled water was poured into a Petri dish (9 cm. in diameter) and divided into quarters, in the centre of each of which a particle of diseased tissue or soil was placed. Three of the segments were transferred in an inverted position to separate Petri dishes and the fourth left, also inverted, *in situ*, care being taken that the agar completely covered the inoculum. The presence of the pathogen in the inoculum was indicated by the appearance of hyphae on the surface within 24 hours at laboratory temperature, and transfers from the tips usually resulted in pure cultures. When reisolations were made from diseased seedlings, the fungus was frequently obtained in an uncontaminated condition in over 90 per cent. of the tests.

White (D. G.). **An electrometric method for defining the area of bark affected by tapping Hevea brasiliensis.**—*Plant Physiol.*, xxi, 1, pp. 102–108, 2 figs., 1946.

Modern practice in tapping the bark of *Hevea* rubber trees often utilizes two cuts on the same tree, which frequently set up reciprocal interference, while separation of panels by an arbitrary distance often leads to disappointing yields, and further, in many cases, to brown blast, responsible on some plantations for rendering 80 per cent. of the trees untappable. With a view, therefore, to avoiding these inconveniences, the author has devised an electrometrical apparatus by means of which it is possible within reasonable limits to define the area of bark influenced by tapping, by estimating the resistance to an electric current exerted by the bark tissues and cell contents, including the latex, at intervals below the tapping incision.

The apparatus consisted of terminals made from discarded hypodermic needles, shortened to within $\frac{1}{2}$ in. of the shoulders, the ends being squared off and sharpened. The bark was punctured firmly at right angles by the needles until the woody tissues were reached. Two terminals were established 1 in. apart horizontally, with other pairs spaced 6 in. apart vertically. Bark tissue resistance to a relatively weak electric current was measured in ohms, using the Bouyoucos bridge method, in which 6-ft. radio-wire leads with spring clamps attached to the terminals assure rapid operation. By this device it was possible to estimate the effect of tapping low-yielding seedling trees with a half-circumference cut. The effect was slight at 18 in. and nil at 24 in. below the tapping cut.

Wager (V. A.). **Compost and disease.**—*Proc. S. Afr. Sug. (Tech.) Ass., 1945*, pp. 85–90, 5 figs., 1945.

The author subjects to severe criticism the claims made in recent propaganda concerning the use of compost in controlling disease (Sir Albert Howard: An agricultural testament, 1940), and gives data from experiments with compost prepared by G. C. Dymond [*R.A.M.*, xxiv, p. 290] on bacterial wilt (*Bacterium* [*Xanthomonas*] *solanacearum*) and eelworm (*Heterodera marioni*) of tomatoes in support of his views.

Watson (S. J.) & Smith (A. M.). **The trace elements in plant and animal nutrition.**—*Scot. J. Agric.*, xxv, 4, pp. 203–212, 1946.

After an introductory discussion of the part played by trace elements in plant nutrition, the authors give short, practical notes on the symptoms and control of iron, magnesium, boron, manganese, copper, and zinc deficiency in plants. Field

diagnosis of these conditions is complicated in some cases by the antagonism of two or more elements, by the effects of environment, and by damage caused through insects or disease. Visual observation is, therefore, a difficult matter, and a reliable diagnosis can, in many instances, be made only by experienced investigators in possession of laboratory facilities.

In Scotland, grey speck of oats [manganese deficiency: *R.A.M.*, xxii, p. 428] and 'raan' of turnips [brown heart, or boron deficiency: ibid., xx, pp. 390, 616] have been rather prevalent in some areas, while a few cases of magnesium deficiencies in tomatoes and *Brassicae* have also occurred.

NIEDERHAUSER (J. S.). **The rust of greenhouse-grown Spearmint, and its control.**—*Bull. Cornell agric. Exp. Sta.* 263, 30 pp., 6 figs., 1945.

Greenhouse-grown spearmint (*Mentha spicata*) in the north-eastern United States becomes almost a total loss in seasons of severe infection by rust (*Puccinia menthae*). The leafy shoots show poor growth after invasion by the rust mycelium, and usually only one cutting has been made before the disease develops seriously, whereas from healthy plants four to five cuttings can be made during the winter season. Leaves bearing the uredosori or teleutosori of the rust are generally considered unmarketable; tedious sorting of these is required after the mint is cut and the saleable crop thus reduced even further. Bed-space occupied by rusted spearmint is lost at least for a month, and sometimes for two or three months, when profitable crops might have been growing there. Successive annual losses put several greenhouse growers out of business in the Rochester area of New York State by 1941.

Systemically invaded spearmint shoots exhibit a hyperplastic symptom-complex, described by the author as bull-shoots, the main axis of which is swollen, chiefly because of enlargement of the cells of the cortical tissues and the increased number of cells in the pith. The internodes of many of these shoots are several times as long as those of healthy ones, making the hypertrophied, chlorotic shoots abnormally tall and causing them to exhibit marked dark red or purplish coloration of the stem. The leaves are dwarfed, chlorotic, thickened, and brittle, many showing a rough, curling, savoying effect, and also sometimes anthocyanescence. The buds in the axils are usually proleptic, and developing into tiny bull-shoots, which in extreme cases cluster about the main stem. In healthy shoots these axillary buds remain undeveloped. Occasionally systemically invaded rhizomes may result from infection at the growing point, exhibiting the same swollen condition noted in the bull-shoots. Most bull-shoots arise, however, from infected buds on otherwise uninvaded rhizomes. Should this delicately adjusted relationship between the rust and the swollen shoot be disturbed by temperatures above 21° C. or by dry soil conditions, of which even healthy plants are not long tolerant, necrosis sets in. It is usually basifugal, but may occur at any place on the bull-shoot and progress both ways, and if it develops first at the base, the whole shoot may collapse and die. If, on the other hand, the upper parts of the bull-shoot die first, the proleptic, axillary buds below the necrosis become particularly large and long. Necrosis of the rhizome begins where the bull-shoots on it have reached their maximum development, and have themselves begun to die.

The first evidence of localized uredo and teleutosori following aecidiospore or uredospore inoculation of the leaves is the appearance of small, yellowish flecks on one or both surfaces of the leaf, enlarging until some are 2 mm. in diameter. At first chloranemic, they finally become necrotic, brown spots which, if the sori are abundant, may become confluent and cause necrosis of larger areas of the leaf. Premature defoliation, which in field-grown mint is responsible for the most severe losses, follows even moderate infection.

The fungus was found not to overwinter as mycelium in the rhizomes, thereby confirming Vergovsky's claim [*R.A.M.*, xv, p. 527] for field-grown peppermint.

Uredospores adhering to the rhizomes or tissue in sori on leaves left on the rhizomes constitute the primary inoculum in the greenhouse. Teleutospores may also be present but do not germinate readily and are relatively unimportant as primary inoculum [ibid., ii, p. 179]. Several cycles may be initiated by the uredospores, but in November or December, after the first cutting, new growth provides excellent infection courts for the basidiospores derived from teleutospores on leaves or the stubble. Later cycles may be initiated by aecidiospores. Control by the hot-water method of Ogilvie and Brian [ibid., xv, p. 763; xvii, p. 6] was probably effective because it killed the spores on the rhizomes and not the mycelium. Treatment of rhizomes by washing only resulted in 27·2 per cent. bull-shoots, by hot water (10 minutes at 44°) followed by dipping in wash water from the preceding treatment in 5·3 per cent., by hot water only in none, while the control gave 39·4 per cent. The use of fungicides might reduce losses in the established bed but is undesirable as the mints are used in food. By planting rhizomes 2 to 4 in. below ground, one grower reduced the ravages of the rust; apparently the inoculum fails to reach the parts above ground. While the development of a rust-immune spearmint may be feasible for the field crop, it is hardly likely to be worth while in the greenhouse.

Campos (A. R.). **Moléstias da Mamoneira no Estado de Pernambuco.** [Castor diseases in the State of Pernambuco.]—*Bol. Agric., Pernambuco*, ix, 1, pp. 55–59, 4 pl., 1942. [Received February, 1946.]

The two fungi responsible for castor [*Ricinus communis*] diseases in Pernambuco, Brazil, were experimentally determined as *Fusarium orthoceras* App. & Wr. [cf. *R.A.M.*, xx, p. 235] var. *ricini* Arruda, which also attacks the same host in São Paulo, and *Sclerotinia ricini* [ibid., vi, p. 526]. The cultivation of the black S(anta) R(osa) variety is advocated as a control measure against *F. orthoceras* var. *ricini*.

Campos (A. R.). **Moléstias da Cana de Açúcar em Pernambuco.** [Sugar-Cane diseases in Pernambuco.] *Bol. Agric., Pernambuco*, viii, 2, pp. 169–174, 4 pl., 1941. [Received February, 1946.]

None of the fungi isolated from sugar-canes suffering from root rot in Pernambuco, Brazil, caused any symptoms of infection in inoculation experiments, and the disease is therefore provisionally attributed to adverse soil conditions. Other pathogens attacking the crop in the State are *Leptosphaeria sacchari*, *Thielaviopsis* [*Ceratostomella*] *paradoxa*, *Fumago sacchari*, *Colletotrichum falcatum* [*Physalospora tucumanensis*], and *Melanconium* (*Trichosphaeria*) [*Pleocyta*] *sacchari*.

Mal da raiz da Cana de Açúcar. [Sugar-Cane root rot.]—*Bol. Agric., Pernambuco*, ix, 2, pp. 115–116, 1942. [Received February, 1946.]

The following measures are recommended by the Agronomic Research Institute, Recife, Pernambuco, Brazil, for the control of sugar-cane root rot of obscure origin [see preceding abstract]: improved methods of soil drainage, rolling, harrowing, furrowing, and the like; application of stable and other organic manures and wood ash; use of selected material for 'seed'; cultivation of resistant varieties, notably P.O.J. 2878, and submission of specimens of suspected material to the Research Institute for accurate diagnosis.

Wiehe (P. O.). **Red rot and M 134/32.** *Rev. agric. Maurice*, xxiii, 6, pp. 242–243, 1 fig., 1944.

The increasingly serious incidence of red rot of sugar-cane [*Physalospora tucumanensis*] in 1944 affecting notably the variety M 134/32, which is of particular importance for sugar cultivation in Mauritius, led the author to resume his studies of this widespread disease.

Initial red-rot infection may occur (*a*) at or near ground-level, usually after mechanical injury, a rare type; (*b*) following borer injuries, the lesions usually being restricted to a small marginal area round the galleries; (*c*) at the growth ring, one-third to half-way up the stem, observed on bent canes, infection coinciding with the outer bend of the growth ring, and frequently associated with desiccation of the epidermis of the rind, whether healthy or diseased. Such desiccation is thought to be due primarily to the April cyclone. Primary infection became manifest at the exterior of the bend, where growth ring tissues were dried up; this was seen both in virgin and ratoon canes.

The author concludes that M 134/32, while still exhibiting higher resistance to *P. tucumanensis* than most of its predecessors, such as the highly susceptible and now discarded DK/74, should not be grown as a 'grande-saison' cane, and that advanced 'babas' should not be left, as these shoots are much more liable to attack by the pathogen.

Baldacci (E.). **Contributo alla sistematica degli Attinomiceti : x–xvi.** [A contribution to the systematics of the Actinomycetes: x–xvi.]—*Atti Ist. bot. Pavia*, Ser. 5, iii (3), pp. 139–193, 2 pl., 1944. [Received February, 1946.]

In these further papers the author continues his studies on the systematic position of Actinomycetes [*R.A.M.*, xix, p. 436; xxv, p. 185], the fungi dealt with including *Actinomyces madurae*, *Proactinomyces ruber*, *P. pseudomadurae*, *P. polychromogenus*, *A. violaceus*, and *A. caeruleus*. Some 200 Latin binomials of species, varieties, and synonyms of species studied by the author are listed.

Viégas (A. P.). **Alguns fungos do Brasil. V. Basidiomycetos-Auriculariales.** [Some fungi of Brazil. V. Basidiomycetes-Auriculariales.]—*Bragantia, S. Paulo*, v, 3, pp. 197–212, 4 pl., 2 figs., 1945.

This further instalment of the author's critically annotated list of Brazilian fungi [*R.A.M.*, xxiv, p. 474] includes, *inter alia*, *Helicobasidium compactum* [ibid., xix, p. 369] on *Inga* sp., *Hybanthus atropurpureus*, and *Urtica* sp., *Septobasidium castaneum* [ibid., xv, p. 59] associated with an undetermined insect on the Olandy cassava variety and with *Aspidiotus symbioticus* on *Ficus* sp., *S. fuscum* with coccids on lime and orange, *S. lepidosaphis* with coccids on orange, *S. pseudopedicellatum* [ibid., xx, p. 13] with unspecified insects on orange and lime, with coccids on citron, orange, and *Aleurites fordii*, and on pigeon pea (*Cajanus indicus*) [*C. cajan*; no insect symbiont mentioned], and *S. saccardinum* with a coccid on pear, and with unidentified insects or coccids on mulberry [ibid., xix, p. 91], *A. fordii*, and numerous other hosts.

Di Fonzo (M. A.). **Las Uredineas del Chaco.** [The Uredineae of the Chaco.]—*Publ. misc. Minist. Agric., B. Aires*, Ser. A, ii, 12, 12 pp., 1946.

Included in this annotated list of rusts of the Chaco, Argentina, is *Puccinia psidii* [*R.A.M.*, xxv, p. 141], the agent of severe damage to guava (*Psidium guajava*). It occurs under local conditions exclusively in the uredospore stage.

Lindquist (J. C.). **Las especies de Puccinias parásitos de Malváceas en la República Argentina.** [The species of *Puccinia* parasitic on Malvaceae in the Argentine Republic.]—*Not. Mus. La Plata*, Bot., x, 47, pp. 17–33, 7 figs., 1945.

Revised descriptions and critical notes are given on seven species of *Puccinia* occurring in Argentina on Malvaceae, including *P. schedonnardi*, hitherto found exclusively in the uredo and teleuto stages on *Muehlenbergia asperifolia* [*R.A.M.*, xviii, p. 392], and *P. malvacearum*. A key to their determination is provided.

WHETZEL (H. H.). **A synopsis of the genera and species of the Sclerotiniaceae, a family of stromatic inoperculate Discomycetes.**—*Mycologia*, xxxvii, 6, pp. 648–714, 36 figs., 1945.

The author places fifteen genera in the family Sclerotiniaceae as he conceives it, the type genus being *Sclerotinia* with the proposed type species *S. sclerotiorum*, and including also *S. trifoliorum* and *S. minor* (*S. candolleana* is placed in his new genus *Ciborinia*). *Monilinia* Honey is used for *M. fructicola*, *M. fructigena*, *M. laxa*, and others with a *Monilia* conidial state. *Stromatinia* Boud. includes as new combinations *S. cepivorum* (Berk.) Whetzel, with apothecia unknown, and *S. gladioli* (Drayton) Whetzel. The new genus *Botryotinia* is based on *B. convoluta* (Drayton) Whetzel, n. comb. (syn. *Sclerotinia convoluta* Drayton) and includes also *B. fuckeliana* (de Bary) Whetzel n. comb. (syn. *S. fuckeliana* (de Bary) Fuckel) and *B. ricini* (Godfrey) Whetzel n. comb. (syn. *S. ricini* Godfrey), with *Botrytis* of the *cinerea* type as conidial state. *Ovulinia* Weiss [*R.A.M.*, xix, p. 412] is accepted for *O. azaleae*. The recent species *S. polyblastis* Greg. and *S. narcissicola* Greg. are not included. The paper concludes with a host index of the genera of plants bearing Sclerotiniaceae.

WHETZEL (H. H.). **The Cypericolous and Juncicolous species of Sclerotinia.**—*Farlowia*, ii, 3, pp. 385–437, 10 pl., 4 figs., 1946.

Descriptions and figures are presented of 10 species of *Sclerotinia* which attack sedges and rushes, including two new ones.

ROBERTS (CATHERINE). **A comparative study of Torulopsis pulcherrima and Taphrina deformans in culture.**—*Farlowia*, ii, 3, pp. 345–383, 3 pl., 2 figs., 1946.

The apparent interrelationship of *Torulopsis pulcherrima* and *Taphrina deformans* was disclosed by the author's studies undertaken to test the validity of Windisch's proposal to incorporate *Torulopsis pulcherrima* in the order Taphrinales as *Candida pulcherrima* [*R.A.M.*, xx, p. 382].

Tabulated data show *T. pulcherrima* and *Taphrina deformans* to be similar in behaviour. Both fungi presented a similar yeast-like appearance when grown at room temperature; both produced reddish or pinkish non-carotinoid pigment, diffusible in the case of *Torulopsis pulcherrima* and non-diffusible in that of *Taphrina deformans*. In *Torulopsis pulcherrima* a predictable mutation-like change involving the production of white sectors occurred with great regularity in pigmented colonies, whereas *Taphrina deformans* showed unpredictable sectoring involving a colour change from pink to yellow or white, occurring frequently or sporadically. In culture both organisms were composed of single, ovoid to globose, budding cells, and in older cultures cell structures indicative of sporulation were observed, and interpreted as ascogenous cells, asci, and ascospores.

A tendency to differentiation of the red and white cultural types on the basis of cell morphology was observed in *Torulopsis pulcherrima* and found to be correlated with the sporulation phenomenon. No such morphological differentiation was noted in *Taphrina deformans* among the three cultural types. A constant uninucleate condition was found in the young vegetative cells of both fungi. *Torulopsis pulcherrima* fermented glucose, but *Taphrina deformans* did not. No physiological differences were observed to occur among the various cultural types of the two fungi.

The result of the author's researches are considered to support the more specific and recent proposal of Windisch [ibid., xx, p. 382] for the transference of *Torulopsis pulcherrima* to the Taphrinales, but, in view of the still imperfect state of knowledge of its cytology, sexuality, and variation the similarities recognized at present do not appear sufficient yet to justify Windisch's proposed transfer of *T. pulcherrima* to the genus *Candida*, and for its incorporation in the Taphrinales in a new family,

the Candidaceae. The finding of pseudomycelium and true mycelium in *T. pulcherrima* indicates that it does not belong to the Torulopsoideae as defined by Lodder [ibid., xiv, p. 192].

HAMMARLUND (C.). **Beiträge zur Revision einiger imperfekten Mehltau-Arten. Erysiphe polyphaga nov. sp. (Vorläufige Mitteilung).** [Contributions to the revision of some imperfect mildew species. *Erysiphe polyphaga* nov. sp. (Preliminary note).]—*Bot. Notiser, 1945*, 1, pp. 101–108, 1945.

It has been shown by the writer [*R.A.M.*, iv, p. 431] and a number of other workers that many of the Erysiphaceae are narrowly specialized as to their host range, and the general tendency of present-day mycologists is to question the authenticity of a number of records in the relevant (especially early) literature concerning the transmission, by artificial inoculation, of certain mildews to plants of unrelated species. However, some recent sudden outbreaks of mildew in various nursery gardens near Stockholm pointed to the possible existence of highly polyphagous species among the Erysiphaceae. For instance, *Oidium begoniae* [ibid., xix, p. 222] is believed to have been first recorded in Sweden in 1932. In 1934 an *Oidium* developed on *Veronica speciosa*, and in the following year perithecia were found in profusion. In 1935 *O. calanchoeae* Lüst. was observed on *Kalanchoë blossfeldiana* [ibid., xiv, p. 586]. *O. cyclaminis*, which in 1933 infected a few flowers of *Cyclamen persicum* [ibid., xix, p. 153], in the following year destroyed the blossoms of the entire 3,000 plants in the same greenhouse. In 1939 about 100 Gloire de Lorraine *Begonia* seedlings from a mildew-free source were placed in a chrysanthemum house for propagation, and in a few weeks all had contracted severe infection from *O. chrysanthemi* [ibid., xix, p. 133]. In 1940 six boxes of *K. blossfeldiana* seedlings were kept for a few days under a table with fairly heavily mildewed *Begonia* plants before transference to a greenhouse already containing *Kalanchoë*; three weeks later some 10 per cent. of the recently potted additions had become infected, and the disease spread rapidly.

A study of the biological connexion between *O. calanchoeae* and *O. begoniae* was initiated on 29th April, 1943, by the inoculation of some *K. blossfeldiana* plants with conidia from Gloire de Lorraine *Begonia*. By 5th May conidial chains had been found on the inoculated plants, and the confirmatory results of repeated experiments during the same month convinced the writer of the identity of the two species. The subsequent inoculation of 100 different species of plants induced positive reactions in 62, belonging to 11 families, including, besides a number of *K.* spp., 18 species of *Sedum*, six of *Bryophyllum*, houseleek (*Sempervivum tectorum*), and other Crassulaceae, *Begonia*, *V. speciosa*, *Cyclamen persicum*, tomato, tobacco, potato, melon, cucumber, flax, *Chrysanthemum indicum*, *C. morifolium*, *Dahlia variabilis*, *Verbena hybrida*, *Hyssopus officinalis*, and *Ricinus communis*.

The shape and size of the conidia of the several biotypes used in these experiments varied greatly according to their hosts, and the term 'forma matricalis' is used to express such modifications. The collective name *Erysiphe polyphaga* is applied to the species hitherto differentiated as *O. calanchoeae*, *O. begoniae*, *O. cyclaminis*, *O. lycopersici* [ibid., x, p. 11], *O. tabaci* [*E. cichoracearum*: ibid., viii, pp. 341, 409], *O. solani* auct. (*E. solani* Vanha) [ibid., i, p. 361], *E. cichoracearum* (from melon, cucumber, and *D. variabilis*), *O. lini* [ibid., xiii, p. 515], *O. chrysanthemi*, *O. verbenae*, *O. hyssopi*, and *O. ricini*. *E. polyphaga* f.m. *veronicae-speciosae* refers exclusively to the strain of the fungus on *Veronica speciosa*. The conidia of *E. polyphaga* f.m. *chrysanthemi-indici* measure on an average 40 by 20 μ and those of f.m. *solani-tuberosi* 27 by 15 μ. If differences of such magnitude are to be found among the various formae matricales of the same biotype, the size of these organs is obviously no fit criterion for the erection of a new species of *Oidium* unless corroborated on the biological side by the results of exhaustive inoculation experiments.

Host modifications are also of great importance in connexion with perithecial production. Inoculation experiments have so far resulted in perithecial formation only in the case of *E. polyphaga* f.m. *veronicae-speciosae*, but some years ago six small perithecia were detected on a naturally diseased *Begonia* plant. These organs were also observed by the author twice in Sweden on cucumber and on *D. variabilis* in Ecuador, while references in the literature to the development of perithecia on potato and tobacco also probably relate to the same fungus.

A close relationship appears to exist between *E. polyphaga* and *E. cichoracearum*, the sole morphological difference being the occasional occurrence in the former (f.m. *veronicae-speciosae*) of asci containing three or four spores besides the usual two-spored. Nevertheless, the separation of the two species appears justifiable on biological grounds, and a provisional diagnosis of *E. polyphaga* n.sp. is given [in German only]. It is characterized by a dense mycelium with simple conidiophores in close juxtaposition and long chains of ellipsoid, barrel-shaped or cylindrical conidia, furnished with a basal, dark brown appendage, mostly longer than the conidial diameter, and 8 to 12 or 10 to 20 asci (f.m. *veronicae-speciosae* and *begoniae*-Gloire de Lorraine, respectively), containing 2 to 4 ascospores.

Quite apart from its theoretical interest, the discovery of this polyphagous mildew on a number of important agricultural and horticultural plants is of considerable practical importance.

Anderson (P. J.). **Diseases of Tobacco in 1943.**—*Bull. Conn. agric. Exp. Sta.* 478, pp. 105–110, 1944. [Received January, 1946.]

In this report [cf. *R.A.M.*, xxiii, p. 45] it is stated that tobacco wildfire [*Pseudomonas tabacum*: ibid., xxiii, p. 430; xxiv, p. 404], though it had almost disappeared locally some years before, was widespread on a broadleaf farm in Glastonbury, Connecticut, in 1943, but was not observed elsewhere. Frenching [ibid., xix, p. 499], distinguished by narrow strap-shaped leaves, is somewhat uncommon in Connecticut; it was found in one grower's seed-bed, but the plants, when set in the field, quickly recovered. It appears that the condition must have been due to some soil abnormality. The prevalence of mosaic on one farm in East Windsor appeared to have originated from unsterilized ground tobacco stems used in the fertilizer mixture.

Further spraying tests again demonstrated that under greenhouse conditions and in the seed-beds fermate (2 lb. per 100 gals.), applied twice a week from the time the seedlings had developed about four leaves, gave perfect control of mildew [*Peronospora tabacina*: ibid., xxiii, p. 45]. Fermate-treated plants were not affected by damping-off. In the seed-bed tests, one section was treated by paradichlorobenzene fumigation, the crystals being distributed every second night on cloth frames over the plants. This gave complete control as long as the treatment was continued. When fumigation ceased, after the plants were ready for setting, mildew developed in about ten days.

Fusarium wilt (*F. oxysporum* var. *nicotianae*) [ibid., xxii, p. 456; xxiii, p. 460] appeared on a few plants at the Experiment Station farm, this being the first record of the disease in the State.

Johnson (J.). **Infection experiments with detached water-congested leaves.**—*Phytopathology*, xxxv, 12, pp. 1017–1025, 3 figs., 1945.

The mechanism of infection in detached, wounded, and uninjured, artificially water-congested leaves of Havana-Seed tobacco and other plants was investigated at the Wisconsin Agricultural Experiment Station in refrigerator pans used as moist chambers, the inoculum in most cases consisting of the wildfire organism, *Phytomonas tabaci* [*Pseudomonas tabacum*: *R.A.M.*, xxv, p. 142], while other tests were carried out with *Phytomonas* [*Pseudomonas*] *angulata*, *Cercospora nicotianae*,

Thielaviopsis basicola, *Pythium* sp., *Rhizoctonia* sp., two fungi not parasitic on tobacco, viz., *Septoria lycopersici* and *Helminthosporium sativum*, some common saprophytes, e.g., *Aspergillus niger* and *Penicillium* spp., a toxin from *Pseudomonas tabacum*, the tobacco mosaic virus (on the hybrid *Nicotiana tabacum* × *N. glutinosa*), rose Bengal dye, and India ink.

No penetration occurred through the normal (uncongested) unwounded tissues of the controls, except in a few cases of protracted incubation, e.g., with *C. nicotianae*. Stomatal entry was frequently effected through unwounded congested tissues. In the presence of congestive and leaf-surface water, particles of sufficiently minute dimensions pass through the apertures. The mechanism involved is the establishment of a capillary force through the formation of a channel of water for the transport of solutions or suspensions between the congestive water and that of the leaf surface. In wounded tissues penetration is usually immediate, and when the leaf is also water-congested, bacterial parasites in particular may be conveyed for considerable distances into the adjacent intercellular areas, where they find enough moisture and nutrients to promote their multiplication and consequent pathogenicity. The destruction of natural barriers to infection by wounding may further impair individual constitutional variations in resistance to disease.

Costa (A. S.). **The relationship between American Tobacco streak and Brazilian 'necrose branca' or 'couve'.**—*Phytopathology*, xxxv, 12, pp .1029–1030, 1 fig., 1945.

In addition to the resemblances already observed between the symptoms induced in tobacco by the streak virus and that of the white necrosis ('necrose branca') or 'cabbage-leaved tobacco' ('couve') occurring in São Paulo, Brazil [*R.A.M.*, xxiv, p. 477], a further similarity has been detected. In the course of studies at the Rockefeller Institute for Medical Research, Princetown, New Jersey, in 1943, the writer noticed that the flowers of Turkish tobacco plants suffering from streak presented a typical feature of the Brazilian disease not hitherto recorded in connexion with the former virus, namely, the termination of the petals in a filamentous appendage.

Grosjean (J.). **Het parasitaire karakter van eenige Polyporaceeën.** [The parasitic character of some Polyporaceae.]—Thesis, Univ. Amsterdam, 96 pp., 5 figs., 1942. [English summary. Received November, 1945.]

Polyporaceae are generally assumed to cause wood rot only in old trunks of living trees, but the writer successfully infected three- to five-year-old oak (*Quercus pedunculata*), poplar (*Populus alba*), and alder (*Alnus incana*) branches with an isolate of *Fomes igniarius* from *Amelanchier vulgaris* (Ottawa, Canada); of *Alnus glutinosa* with an isolate of the same fungus from birch (*Betula verrucosa*) from Omsk, Siberia; of *Pseudotsuga douglasii* [*P. taxifolia*] with a culture of *F. laricis* from the Forest Products Laboratory, Madison, Wisconsin; and of wild cherry (*Prunus avium*) with one of *F. pomaceus* supplied by K. St. G. Cartwright from England. Positive results were secured only by the introduction of the inoculum into the oldest annual rings of the branches. The fungi were more 'aggressive' when cultured on wood than when bread was used as a medium.

Trees are commonly supposed to be more susceptible to wood-rotting fungi during the winter than at any other season, but no evidence was forthcoming in these experiments of better results with early March inoculations than with those undertaken in April and May. The decay induced by the inoculations spread at the rate of only a few cm. a year.

The growth of saprophytic bark fungi on material for use in laboratory experiments may be prevented by treatment with acetic acid, which must be kept from contact with the wood, or by one hour's sterilization in an autoclave at 0·75

atmospheric pressure and a temperature of 115° C.; ammonia, formalin, and mercuric chloride are unsuitable for the purpose. Desiccation of the branches may be obviated by maintenance in a saturated atmosphere, but not actually in water. Under these conditions the type of decay induced, e.g., by *F. igniarius* on poplars (*Populus nigra* and *P. alba*), *F. robustus*, *F. laricis*, *F. pomaceus*, *Daedalea unicolor*, and *Polyporus cuticularis* on *Populus alba*, *F. laricis* and *D. unicolor* on beech, *F. robustus* and *D. unicolor* on oak, and the latter on *P. nigra*, was similar to that observed in nature, but proceeded at a more rapid rate and was less specialized.

A suitable technique for the staining of mycelium in wood consists in heating the material in picro-aniline blue, as described by Cartwright (*Ann. Bot., Lond.*, xliii, pp. 412–413, 1929), followed by successive washing in water, alcohol, and lactophenol-alcohol.

Carter (J. C.). **Wetwood of Elms.**—*Bull. Ill. nat. Hist. Surv.*, xxiii, 4, pp. 407–448, 25 figs., 4 graphs, 1 map, 1945.

A full account is given of studies and field observations carried out in Illinois from 1939 to 1943 on an unusual elm wilt first noticed at Hinsdale in the summer of the former year and subsequently shown to be a secondary pathological manifestation of wetwood, a water-soaked, dark discoloration of the heartwood closely related to slime flux, a chronic bleeding at crotches and wounds, and associated with an abnormally high sap pressure in the trunk. None of the 284 trees affected at Hinsdale died during the period under review, and only 73 wilted in more than one of the five years. The elm species suffering from the disease were the American (*Ulmus americana*) and its cultivated varieties Moline and Littleford, the slippery (*U. fulva*), the English (*U. procera*), and the Siberian (*U. pumila*). Cultures of 239 out of 346 samples from 21 counties yielded a bacterium which is named *E. nimipressuralis* n.sp., similar to, but not identical with, *Erwinia salicis* [*R.A.M.*, xiii, p. 334] and *Pseudomonas lignicola* [ibid., ix, p. 5].

The organism inhabits principally the vessels and ray cells of the trunk. It does not grow in sufficient abundance to cause general clogging of the conducting tissues, nor does it induce disintegration of the tissues occupied. Wetwood and flux developed as a sequel to trunk wood inoculations with the bacterium, while the introduction of wetwood sap into the current-season wood of young trees caused wilting. The greyish-brown streaks in the current-season wood appear to be due to the discoloured sap and not to the bacterium itself, which was seldom isolated from wilting branches.

Trunk pressures in wetwood-affected elms commonly reached 5 to 30 lb. per sq. in. and attained a maximum in trees that did not flux, a pressure of 60 lb. per sq. in. being recorded in one tree in 1942. Pressures in diseased trees began to develop in April and early May, increased until August or September, and then fell until late December or January. In inoculated greenhouse trees they followed a diurnal cycle with a maximum between 11 a.m. and 1 p.m. and a minimum between 7 and 11 p.m.

Gas from infected trees contained 46·4 per cent. methane, 33·8 per cent. nitrogen, 14·3 per cent. carbon dioxide, 4·5 per cent. oxygen, and 1 per cent. hydrogen. Phosphates and a large quantity of potassium were present in sap samples. P_H determinations showed the sap and discoloured wood of diseased trees to be alkaline (7·67 and 7·39, respectively), in contrast to the normal acid reactions (6·35 and 5·89, respectively).

E. nimipressuralis is a rod with rounded ends, 0·68 to 2 by 0·34 to 0·68 (average 0·68 to 1·35 by 0·34 to 0·68) μ, occurring singly, or rarely in pairs or chains; motile by means of up to six peritrichiate flagella; anaerobic, Gram-negative, and non-acid-fast. On potato dextrose agar the colonies are circular, smooth, flat or slightly

raised, and whitish-cream. Gelatine is not liquefied; nitrates are reduced to nitrites without gas formation; hydrogen sulphide is produced, but no indole; starch is not hydrolysed or pectin fermented; milk is coagulated; litmus and bromocresol purple are reduced; the methyl red and Voges-Proskauer tests are positive. The minimum, optimum, and maximum growth temperatures are 5° C. or below, 24° to 30°, and 37°; the thermal death point 45° to 55°; and the minimum, optimum, and maximum P_H 4·67, 6·82 to 7·5, and 10+, respectively. The bacterium evolves both acid and gas from arabinose, rhamnose, xylose, dextrose, fructose, gelactose, manumose, lactose, maltose, trehalose, melibiose, cellobiose, mannitol, sorbitol, and salicin, and a slight amount of both from starch, the data in connexion with sucrose, raffinose, melezitose, dulcitol, glycerol, and elm sawdust were conflicting.

The only one of the various measures tested to give at least temporary control of flux was the installation of drains in the trunks to provide an artificial outlet for the abnormally produced sap and gas.

Ankudinov (A. M.). Сердцевинная гниль осины и меры борьбы с ней. [Heart rot of Aspen and its control.]—*Труд. Всесоюз. Научноисследов. Инст. Лес. Хоз. ВНИЛХ.* [*Trans. U.S.S.R. Inst. For. Res.*], vii, pp. 3–67, 1939. [Abs. in *For. Abstr.*, vii, 2, p. 221, 1945.]

This is an expanded account of studies on heart rot of aspen (*Populus tremula*), a widely distributed forest tree in the U.S.S.R., caused by *Fomes igniarius*, already noticed from another source [*R.A.M.*, xix, p. 373].

Ermilova (Мме. V. S.). Причины и развития гнили у осины и меры борьбы с ней. [Causes and control of rot in Aspen trees.]—*Труд. Всесоюз. Научноисследов. Инст. Лес. Хоз. ВНИЛХ.* [*Trans. U.S.S.R. Inst. For.Res.*], vii, pp. 69–77, 1939. [Abs. in *For. Abstr.*, vii, 2, p. 221, 1945.]

Studies of stands of 35 to 40-year-old aspen trees in the forests of the Tartar A.S.S.P. and on 1,000 trees, 5 to 12 years old, in the Kama river basin, some growing on flood land and others on terraces above flood-level, showed that aspens both of vegetative and seedling origin develop two types of rot, stump and stem rot. The latter develops twice as quickly as the former and results mainly from unhealed wounds left by dead branches, which are attacked by *Fomes igniarius* [see preceding abstract]. Proper thinning and artificial pruning to supplement self pruning are discussed.

Service and regulatory announcements, July–September, 1945. Plant quarantine import restrictions, Commonwealth of Australia.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 164, p. 41, 1945.

Proclamation No. 20 P, gazetted 20th January, 1941, amending Proclamation No. 2 P (19th September, 1935), prohibits the importation into Australia, except by permission of the Minister of Agriculture, of all plants or parts thereof (excluding the seeds) of the sub-orders or tribes Pomeae or Pruneae, of the order Rosaceae, which were grown in any country harbouring pear- or fireblight (*Bacillus amylovorus*) [*Erwinia amylovora*: *R.A.M.*, xv, p. 382].

New Citrus canker regulations.—*N.Z. J. Agric.*, lxxii, 1, p. 80, 1946.

The Citrus Canker Regulations, 1945, which became effective on 6th December 1945, superseding those of 1940, limit the powers of an inspector to order the destruction of all citrus trees found infected with citrus canker [*Xanthomonas citri*] and also of trees located within 36 ft., measured from trunk to trunk, of such trees. On recurrence of citrus canker in a plantation within 12 months, inspectors may require all trees remaining on the land, or such as he may specify, to be destroyed.